

XP
H947
V. 76
#4

PHYTOLOGIA

An international journal to expedite plant systematic, phytogeographical
and ecological publication

Vol. 76

April 1994

No. 4

CONTENTS

TURNER, B.L., <i>Hedeoma rzedowskii</i> (Lamiaceae), a new species from north-central México.	277
TURNER, B.L., <i>Verbesina tamaulipana</i> (Asteraceae), a new species from México, belonging to section <i>Ocractinia</i>	281
GRANT, J.R., Three new species of <i>Racinaea</i> (Tillandsioideae: Bromeliaceae) from Ecuador and Perú.	284
TURNER, B.L., Species of <i>Lupinus</i> (Fabaceae) occurring in northeastern México (Nuevo León and closely adjacent states).	290
GRANT, V., <i>Gilia jacens</i> (Polemoniaceae): Species or subspecies?	303
GLAD, J.B., R.R. HALSE, & R. MISHAGA, Observations on distribution, abundance, and habitats of <i>Sidalcea nelsoniana</i> Piper (Malvaceae) in Oregon.	307
POWELL, A.M. & S.C. YARBOROUGH, A new species of <i>Perityle</i> (Asteraceae, Helenieae) from Arizona.	324
MCINTOSH, L., First report of <i>Castilleja ornata</i> (Scrophulariaceae) from the United States.	329
TURNER, B.L., Native species of <i>Bauhinia</i> (Caesalpiniaceae) occurring in northeastern México.	333
Phytologia Memoirs available.	344

PHYTOLOGIA (ISSN 00319430) is published monthly with two volumes per year by Michael J. Warnock, 185 Westridge Drive, Huntsville, TX 77340. Second Class postage paid at Huntsville, TX. Copyright 1994 by PHYTOLOGIA. Annual domestic individual subscription (12 issues): \$40.00. Annual domestic institutional subscription (12 issues): \$44.00. Foreign and/or airmail postage extra. Single copy sales: Current issue and back issues volume 72 to present, \$400; Back issues (previous to volume 72), \$3.00 (add \$.75 per copy postage and handling US [\$1.50 per copy foreign]). Back issue sales by volume: \$17.00 per volume 42-71 (not all available as complete volumes); \$21.00 per volume 72-present; add \$3.00 per volume postage US (\$6.00 per volume foreign). POSTMASTER: Send address changes to Phytologia, 185 Westridge Drive, Huntsville, TX 77340.-8916.

**HEDEOMA RZEDOWSKII (LAMIACEAE), A NEW SPECIES FROM
NORTHCENTRAL MEXICO**

Billie L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

A new species of *Hedeoma*, ***H. rzedowskii*** B.L. Turner, is described from northcentral México. It is closely related to *H. patrinum* of the subgenus *Poliomenthoides* and is known only from the Mexican states of Aguascalientes and San Luis Potosí. A map showing the distribution of *H. patrinum* and *H. rzedowskii* is presented.

KEY WORDS: Lamiaceae, *Hedeoma*, México

Routine identification of Mexican species of *Hedeoma* has revealed the following novelty.

Hedeoma rzedowskii B.L. Turner, *sp. nov.* TYPE: MEXICO. Aguascalientes: ladera N del Cerro San Juan, 5 km al E de Tepezalá, 2300 m, 31 Oct 1967, *J. Rzedowski 24978* (HOLOTYPE: LL!).

Hedeomati patrino Stewart similis sed foliis late ellipticis vel orbicularibus, 1.0-1.7plo longioribus quam latioribus (vs. foliis late oblanceolatis vel anguste ellipticis, 1.6-3.0plo longioribus quam latioribus) et calycis dentibus 3 superis deltoideis per ca. 1/3 longitudinis connatisque (vs. dentibus anguste deltoideis ad basim liberisque).

Erect perennial suffruticose herbs 10-30 cm high. Stems with reflexed hispidulous or strigose hairs. Leaves mostly 3-7 mm long, 2-4 mm wide; petioles 0.5-1.4 mm long; blades elliptic-oval to nearly orbicular, 1.0-1.7 times as long as wide, glandular-punctate, densely appressed-strigose below, less so or becoming glabrescent above, the margins entire. Flowers arranged 1-3 in

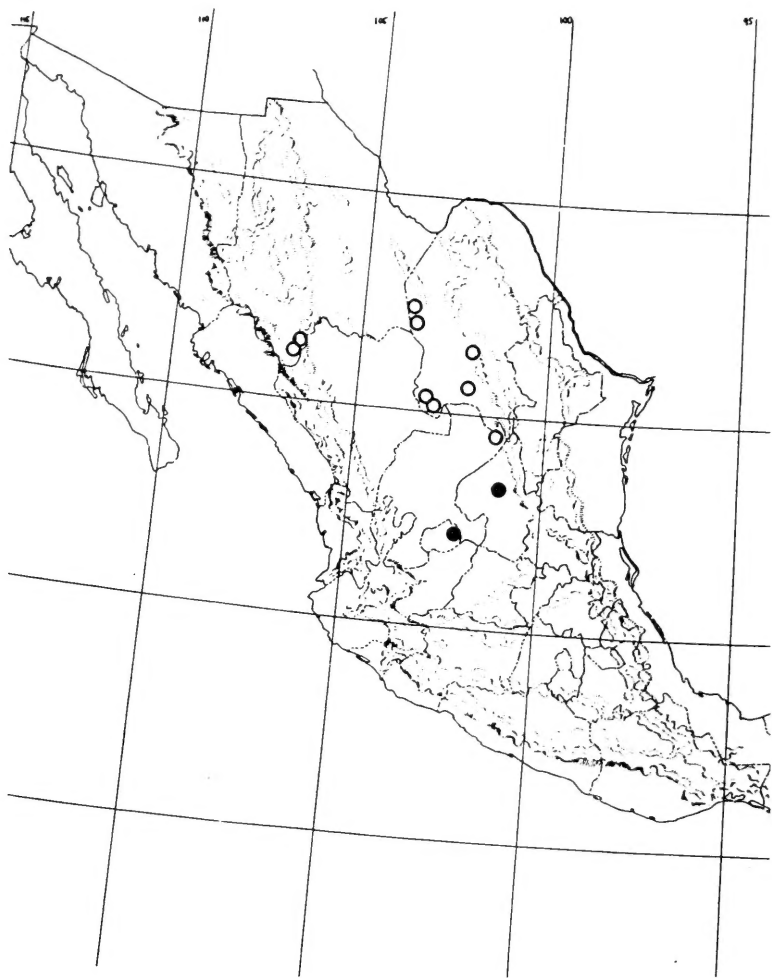


Figure 1. Distribution of *Hedeoma patrinum* (open circles) and *H. rzedowskii* (closed circles); based upon specimens in the Plant Resources Center (LL,TEX).

the axils of upper leaves, the pedicels 2-4 mm long, both minutely glandular-pubescent and pilose-hispid. Calyces 6-7 mm long, the 3 upper teeth triangular, united for ca. 1/3 their length, ca. 1 mm long, the 2 lower teeth, 2.2-3.0 mm long, the tube 12-14 ribbed, atomiferous-glandular along the grooves, otherwise pubescent like the pedicels, the orifice with a well-defined annulus ca. 1 mm wide. Corollas 12-15 mm long, lavender, zygomorphic, the upper 2 lobes 2.5-3.0 mm long, the lower lobes 4-5 mm long. Stamens 2, their anthers connate. Nutlets ca. 1.2 mm long, 0.7 mm wide, smooth or seemingly so.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. San Luis Potosí: W slope of Cerro "La Cuchilla" in Sierra de Catorce, ca. 1 km by tortuous road below Mina Terras Negras (73° 35' 30" N, 100° 53' 20" W), 2550 m, pine-oak woodland, 18 May 1973, Johnston, Wendt, & Chiang 11084 (TEX).

To judge from his description, Irving (1980) included both of the above cited specimens in his concept of *Hedeoma patrinum* Stewart. He called attention, however, to a collection from Aguascalientes by McVaugh (29685 [MICH]) which was said to be quite different from the more northern 'typical' material in having more cinerous, curling, hairs on the leaves, the upper teeth of the calyx deltoid and "well united", approaching that of *H. jucundum* E. Greene. Strangely, while Irving annotated (in 1976) both the type of *H. rzedowskii* and the collection from San Luis Potosí (cited above), he neglected to map the latter, which clearly belongs to what I call *H. rzedowskii*, but it has a much denser pubescence which is persistent on both leaf surfaces.

The two taxa are readily distinguished by the following couplet and their distribution is shown in Figure 1.

Blades of the leaf elliptic-lanceolate to narrowly elliptic, mostly 2-3 times as long as wide; petioles mostly 1.6-3.0 mm long; upper 3 calyx-teeth narrowly deltoid, free to the base or nearly so; n Zacatecas northwards (Figure 1). *H. patrinum*

Blades of the leaf broadly elliptic to orbicular, mostly 1.0-1.7 times as long as wide; petioles mostly 0.5-1.4 mm long; upper 3 calyx teeth deltoid, united for ca. 1/3 their length; Aguascalientes and San Luis Potosí. ...
..... *H. rzedowskii*

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis, and to him and T.P. Ramamoorthy for reviewing the paper.

LITERATURE CITED

Irving, R. 1980. The systematics of *Hedeoma* (Labiatae). Sida 8:218-295.

**VERBESINA TAMAULIPANA (ASTERACEAE), A NEW SPECIES FROM
MEXICO, BELONGING TO SECTION OCHRACTINIA**

Billie L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

A new species of *Verbesina*, *V. tamaulipana* B.L. Turner, is described from the Sierra Tamaulipas of northeastern México. It belongs to the section *Ochractinia* where it relates to *V. microptera* and *V. virginica*, differing from both of these in having mostly basal leaves and larger ray florets.

KEY WORDS: Asteraceae, *Verbesina*, *Ochractinia*, México

Olsen (1985) provided a synopsis of sect. *Ochractinia* of *Verbesina* in which he recognized 40 species, most of these restricted to North America and recognized by their white ray and disk florets. The present novelty adds an additional species.

Verbesina tamaulipana B.L. Turner, *sp. nov.* TYPE: MEXICO. Tamaulipas: Sierra Tamaulipas, Tres Piedras Canyon, pine-oak ridge in igneous rocky soils, along trail to Los Cerritos (ca. 23° 12' 10" × 98° 14' 30"), 720-740 m, 7-8 Oct 1993, *T.F. Patterson 7306*, with Mark Mayfield (HOLOTYPE: TEX!; Isotypes: ENCB!, MEXU!, WIS!).

Verbesinae micropterae DC. similis sed foliis plerumque basalibus (vs. secus caules aequaliter dispositis), capitulis paucioribus in capitulescentia laxiore, et flosculis radii ligulis longioribus (6-8 mm longis vs. 3-4 mm) differt.

Perennial herbs 25-55 cm high. Stems stiffly erect, winged throughout, the wings sparsely pilose, 0.5-2.0 mm wide. Leaves mostly clustered near the base of the stem forming a pseudo rosette, abruptly much reduced above

the cluster; larger (basal) leaves mostly 10-20 cm long, 4-7 cm wide; petioles broadly winged, 3-5 cm long; blades broadly ovate to elliptic, irregularly dentate, pilose beneath, especially along the veins. Capitulescence broad and open, 3-12 headed, the ultimate peduncles mostly 2-5 cm long, densely long-pilose. Involucres campanulate, 4-5 mm high, the bracts 2-3 seriate, lanceolate, appressed-pilose, subequal. Receptacular bracts with white scarious acute apices. Ray florets ca. 11, pistillate, fertile, the ligules white, mostly 6-8 mm long, 2-3 mm wide. Disk florets 50-60 (estimated); corollas white, 3-4 mm long, the tube ca. 1 mm long. Anthers purple-black, the appendages white or purple. Achenes ca. 3.5 mm long, the wings ca. 0.8 mm wide (rarely wingless); pappus of 2 awns 1.0-1.5 mm long.

ADDITIONAL SPECIMEN EXAMINED: MEXICO. Tamaulipas: Sierra Tamaulipas, Ejido El Cabrito, 27 Sep 1984, *Rodriguez et al.* 113 (TEX).

This taxon is clearly closely related to the widespread *Verbesina microptera* DC. but is readily distinguished from that species by having mostly basal leaves (vs. evenly distributed along the stems), a more open, fewer-headed, capitulescence with larger heads and much longer ligules (6-8 mm long vs. 2-4 mm long). When first examined, I took the plants concerned to be abnormal or atypical forms of *V. microptera*, but one of the collectors, Mr. Mark Mayfield, assured me that the peculiar, mostly basal-leaved habit and larger heads occurred throughout the area. Several populations were observed over a large area and the plants concerned were consistent between and within populations.

Verbesina tamaulipana and *V. microptera* belong to the sect. *Ochractinia* of *Verbesina*. In the U.S.A., *Ochractinia* is represented by only two herbaceous species, *V. virginica* L. and *V. microptera* (Olsen 1979). Subsequently, Olsen (1985) provided a synoptic study of the North American *Ochractinia*, most of the species being white-flowered tropical or subtropical shrubs or trees. He recognized two closely related herbaceous species in northeastern México, *V. microptera* and *V. rumicifolia* B.L. Robs. & Greenm. With my description of *V. tamaulipana*, there are now three closely related herbaceous species of sect. *Ochractinia* in northeastern México, as follows:

1. Leaves mostly clustered near the base of stems; ray florets with ligules 6-8 mm long; Sierra Tamaulipas, Tamaulipas. *V. tamaulipana*
1. Leaves evenly distributed along the stems; ray florets with ligules 2-4 mm long. (2)
 2. Midstem leaves 15-25 cm long, the blades widest at or near the middle, sparsely pubescent beneath, mainly along the veins, otherwise glabrous; central Coahuila. *V. rumicifolia*
 2. Midstem leaves 8-20 cm long, the blades widest well below the middle, evenly pubescent throughout; widespread. *V. microptera*

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis, and to him and Mark Mayfield for reviewing the manuscript.

LITERATURE CITED

- Olsen, J. 1979. Taxonomy of the *Verbesina virginica* complex (Asteraceae). *Sida* 8:128-134.
- . 1985. Synopsis of *Verbesina* sect. *Ochractinia* (Asteraceae). *Pl. Syst. Evol.* 149:47-63.

THREE NEW SPECIES OF *RACINAEA* (TILLANDSIOIDEAE:
BROMELIACEAE) FROM ECUADOR AND PERU

Jason R. Grant

Department of Botany, University of Maryland, College Park, Maryland
20742-5815 U.S.A.

ABSTRACT

Study of specimens at the U.S. National Herbarium (US) and from the Marie Selby Botanical Gardens (SEL) have revealed three novelties in *Racinaea* Spencer & Smith. The taxa are described as *Racinaea euryelytra* J.R. Grant, *sp. nov.* from Ecuador, and *R. kalliantha* J.R. Grant, *sp. nov.* and *R. lymansmithiana* J.R. Grant *sp. nov.* from Perú.

KEY WORDS: Bromeliaceae, Tillandsioideae, *Racinaea*, Ecuador, Perú

Racinaea euryelytra J.R. Grant, *sp. nov.* TYPE: ECUADOR. Loja: 88 km north of Loja on road to Cuenca, 3050 m, 04 Oct 1981, *Luther, Besse, & Halton 689* (HOLOTYPE: SEL). Other material examined. ECUADOR. Loja: south of Jimbura in dryer cloudforest, Mar 1984, *Höijer & Dalstrom 653* (SEL); Zamora-Chinchi: Cordillera del Condor, ca. 1500 m, Jun 1990, *Girko E90-190J* (SEL).

R. parviflora (Ruiz & Pavon) Spencer & Smith affinis sed robustior differt, ramis lateralis brevioribus, vaginae grandior et plus rotundatis, foliis crassis coriaceis, sepalisque longioribus, scapo robustiore.

Plants epiphytic, acaulescent, flowering 18-38 cm tall. Leaves triangular in overall outline, 15-20 per plant; sheaths large, ovate, distinct, giving the plant a very tufted and inflated appearance, 3.5-6.0 cm long, 3.5-6.0 cm wide; blades linear-triangular, 60-120 mm long, 2-8 mm wide. Inflorescence bipinnate, or

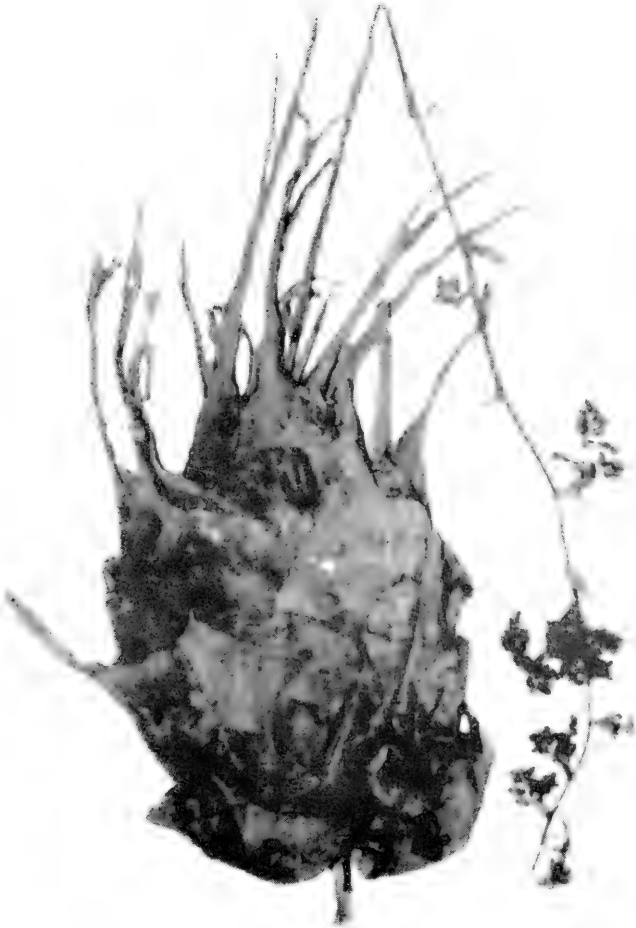


Figure 1. Holotype of *Racinaea euryelytra* J.R. Grant.

tripinnate at base to bipinnate towards apex. Secondary branches 10-28 mm long. Tertiary branches 7-10 mm long. Rachises straight to merely geniculate. Primary bracts acute, carinate, 9-25 mm long, 3-6 mm wide, becoming gradually shorter towards the apex. Floral bracts acute, ovate, carinate, 3 mm long, 2.5-3.0 mm wide. Sepals obovate, carinate, 3.8-4.0 mm long, 3 mm wide, exceeding the floral bracts. Petals unknown.

The epithet derives from the Greek, *eury*, wide, and *elytra*, sheath, to emphasize its large, wide, leaf sheaths.

The three specimens attributed to this new species were previously identified as *Tillandsia* (*Racinaea*) *adpressa* André. They are, however, not related to *T. adpressa* but rather likely most closely to *R. parviflora* from which they differ by their more robust appearance, shorter lateral branches, larger, rounder sheaths, thick, leathery leaves, longer sepals, and more robust scape. *Racinaea euryelytra* is a distinct taxon recognizable by its tufted appearance formed by leaves with large sheaths and narrow blades.

Racinaea kalliantha J.R. Grant, *sp. nov.* TYPE: PERU. Dept. Piura: Prov. Huancabamba, Loma redonda, 2400 m, 15 Sep 1981, *Sagástegui 10210* (HOLOTYPE: SEL).

R. blassii (L.B. Smith) Spencer & Smith *affinis* sed foliis unicoloratis differt, internodia, bracteis florigeris et sepalis longioribus, indumentis ferrugineis, inflorescentia paucior floribus, et ramis lateralis brevioribus.

Plants epiphytic, acaulescent, flowering 33 cm tall. Leaves linear-triangular in overall outline, 8-9 per plant, 20-22 cm long; sheaths ovate, gradually merging into the blades, 6-7 cm long; blades linear, 14-15 cm long, 1-10 mm wide. Inflorescence tripinnate. Primary bracts linear, 8-25 mm long, 3-5 mm wide, becoming gradually shorter towards the apex of the inflorescence. Secondary branches 3.5-6.0 cm long. Tertiary branches 1.5-3.5 cm long. Floral bracts ovate, acute, 3.5-4.0 mm long, 3 mm wide. Sepals ovate, acute, carinate, 3.5-4.5 mm long, 3.0-3.5 mm wide. Scape, inflorescence, rachises, floral bracts, primary bracts, and sepals white-pilose to ferruginous-lepidote. Sepals exceeding the floral bracts. Petals exceeding the sepals, 6 mm long, cream-colored. Androecium and gynoecium included.

The epithet derives from the Greek, *kalos*, beautiful, and *anthos*, flower, for the showy flowers of the plant.

Racinaea lymanSmithiana J.R. Grant, *sp. nov.* TYPE: PERU. Dept. Piura: Prov. Ayabaca, Bosque de Huamba, 2,950 m, 20 Sep 1987, *Cano 1449* (HOLOTYPE: US).



Figure 2. Holotype of *Racinaea kalliantha* J.R. Grant.



Figure 3. Holotype of *Racinaea lymansmithiana* J.R. Grant.

R. flexuosa (Baker) Spencer & Smith affinis sed foliis brevior differt, inflorescentia confertior compactis pilosior, rachidibus flexuosior, sepalis late obovatis.

Plants epiphytic, acaulescent, flowering 43 cm tall. Leaves broadly-triangular in overall outline, 8-10 per plant, 19-24 cm long; sheaths ovate, gradually merging into the blades, 6-9 cm long, 5-7 cm wide at their broadest; blades linear-triangular 13-15 cm long, 3-15 mm wide. Inflorescence primarily tripinnate, but bipinnate at apex. Scape 24 cm long, inflorescence 19 cm long, both white pilose. Rachises, primary bracts, floral bracts, and sepals densely ferruginous-lepidote. Rachises geniculate. Primary bracts 3-25 mm long, 2-8 mm wide, linear, becoming smaller toward apex of inflorescence. Secondary branches 20-47 mm long, tertiary branches 15-20 mm long. Floral bracts acute, ovate in overall outline, 2.8-3.0 mm long, 3 mm wide at broadest. Sepals, obovate, ferruginous-lepidote, exceeding the floral bracts, 4 mm long, 2.5-3.0 mm wide. Petals unknown. Fruit exceeding the calyx, at least twice its length.

The species honors Dr. Lyman Bradford Smith, 1904, authority of the Bromeliaceae.

ACKNOWLEDGMENTS

I thank the curators at the Marie Selby Botanic Garden (SEL) for sending material for study, and Harry E. Luther, James L. Reveal, and James R. Rundell for review of the manuscript.

SPECIES OF *LUPINUS* (FABACEAE) OCCURRING IN NORTHEASTERN MEXICO (NUEVO LEON AND CLOSELY ADJACENT STATES)

Billie L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

A revisionary study of *Lupinus* for northeastern México (Coahuila, Nuevo León, and Tamaulipas) is rendered. Ten species are recognized: *L. bartlettianus* C.P. Smith; *L. caballoanus* B.L. Turner, *sp. nov.*; *L. havardii* S. Wats.; *L. hintonianorum* B.L. Turner, *sp. nov.*; *L. muelleri* Standl.; *L. platamodes* C.P. Smith; *L. partisans* Rose; *L. stipulatus* Agardh; and *L. tezensis* Hook. A key to these taxa, relevant synonymy, and distributional maps are provided. Chromosome counts of $n = 18$ pairs were obtained from several populations from México previously referred to *L. leonensis*, the latter herein treated as part of *L. tezensis*; counts of $2n = \text{ca. } 24$ pairs are reported for *L. caballoanus*.

KEY WORDS: Fabaceae, *Lupinus*, México, chromosomes

Lupinus, with 1000 or more described species, is a taxonomically difficult genus. This is especially true for México where numerous names from isolated regions have been proposed. Dunn (1981) has provided a useful account of those taxa occurring in the immediate environs of México City and McVaugh (1987) has provided a treatment of the genus for his *Flora Nova-Galiciana*. Dunn & Harmon (1977) produced a very useful study of the Mexican species centering about *Lupinus montanus* H.B.K., while C.P. Smith (1938-1953), in many issues of his notorious Species Lupinorum, provided miscellaneous floristic accounts for the lupines of central and northwestern México.

Floristic treatments of the lupines occurring in northeastern México are largely wanting, and the taxa described for this region by C.P. Smith are held to be highly suspect, especially since six of these were described from a single, relatively restricted mountainous area of Tamaulipas (*cf.* synonymy under *Lupinus bartlettianus* C.P. Smith, below).

My attempts to identify the numerous collections of *Lupinus* assembled in recent years by the Hinton family have provided the impetus for the present

study. I have tried to be conservative in my judgments as to what constitutes a species in this group, but by the morphological criteria established for species recognition in *Lupinus* by earlier workers, it is difficult to assess specific lines. In short, the observations and hypotheses speculated upon here need to be shorn up by additional observations, especially field study.

KEY TO LUPINES OF NORTHEASTERN MEXICO

(Coahuila, Nuevo León, and Tamaulipas)

1. Winter annuals or biennials.(2)
1. Perennials.(3)
 2. Inflorescence at full anthesis mostly 5-20(-25) cm long; leaflets glabrous above, or nearly so, pubescent below. *L. texensis*
 2. Inflorescence at full anthesis mostly 30-40 cm long; leaflets pubescent on both surfaces. *L. havardii*
3. Midstem leaves with stipules united at their base for 2/3 their length or more, the free portions mostly shorter than the united portion.
 *L. cacuminis*
3. Midstem leaves with stipules united at their base for 1/3 their length or less, the free portions mostly longer than the united portion. (4)
 4. Stem hairs more or less viscid-pilose, spreading at right angles to the stem; vicinity of Cabo de Caballos; Nuevo León and closely adjacent Tamaulipas. *L. caballoanus*
 4. Stem hairs variously appressed to ascending, but not as described in the above.(5)
5. Banner clearly pubescent on the adaxial (back) surface near the apex; midstem leaves with leaflets mostly 6-8 cm long. *L. hintoniorum*
5. Banner mostly glabrous throughout, or if sparsely pubescent with a few hairs on the dorsal surface, then the midstem leaves with leaflets mostly 3-5 cm long.(6)
 6. Banner 5-7 mm high, clearly much shorter than the wing and keel petals are long. *L. stipulatus*
 6. Banner 10-20 mm high, as high as the wing and keel petals are long.
(7)

7. Petioles pubescent with brown or dark tawny hairs, some or many of the latter 1.5 mm long or more; Sierra de San Carlos, Tamaulipas.
..... *L. bartlettianus*
7. Petioles pubescent with white or silvery hairs, the latter mostly 0.8 mm long or less.(8)
8. Midstem leaves with leaflets broadly oblanceolate, mostly 15 mm wide. *L. platamodes*
8. Midstem leaves with leaflets linear-oblanceolate, mostly 3-8 mm wide.(9)
9. Banner glabrous throughout; leaves mostly 6-10 cm long; mostly fall-flowering. *L. potosinus*
9. Banner pubescent dorsally with 1 or a few hairs; midstem leaves mostly 3-6 cm long; mostly spring-flowering. *L. muelleri*
1. *Lupinus bartlettianus* C.P. Smith, *Sp. Lup.* 253. 1941. TYPE: MEXICO. Tamaulipas: Sierra de San Carlos, La Vegonia, vicinity of San José, 3000 ft., 2 Jul 1930, *H.H. Bartlett 10023 "f"* (HOLOTYPE: CAS!).
- Lupinus partisans* Rose var. *bartlettii* C.P. Smith, *Sp. Lup.* 45. 1938. TYPE: MEXICO. Tamaulipas: Sierra de San Carlos, La Vegonia, vicinity of San José, 3000 ft., 2 Jul 1930, *H.H. Bartlett 10023 "e"* (LECTOTYPE [selected here]: CAS!).

When originally described, Smith designated collection number 10023 (w/o subscripts) as the type. Later, in his description of *L. bartlettianus* and cohorts, he provided lettered subscripts to all of Bartlett's collections from the Sierra de San Carlos. While he listed the lectotype selected here as belonging to his concept of *L. bartlettianus*, he cited its type as 10023 "f", which confuses the typification process, since we have two different names proposed by the same author with the same type. Since in his original description of *L. p.* var. *bartlettii* Smith did not provide lettered subscripts, I have selected from among the two subsequently subscripted numbers 10023 "e" to lectotypify his *L. p.* var. *bartlettii*. This would seem prudent since Smith in his prologue gave the name "*Lupinus bartlettianus* sp. nov." as the correct name for the taxon, although he subsumed his earlier var. *bartlettii* under it. Apparently he

did not intend to provide a new combination in this instance (which might be inferred). Regardless, treated at the rank of species, the correct name would be *L. bartlettianus*, as treated here. It will be noted that under *L. omalophyllus* C.P. Smith (discussed below), each of the remaining collections of *Bartlett 10023* to which subscripts were added by Smith (*10023 a, b, c, d*) were positioned in his concept of *L. omalophyllus* (typified by *10023 c*).

Lupinus harleyanus C.P. Smith, *Sp. Lup.* 355. 1941. TYPE: MEXICO. Tamaulipas: Sierra de San Carlos, Cerro Barril, vicinity of San José, 19 Jul 1930, *H.H. Bartlett 10479 "e"* (HOLOTYPE: CAS!).

Lupinus oligostolus C.P. Smith, *Sp. Lup.* 253. 1941. TYPE: MEXICO. Tamaulipas: Sierra de San Carlos, Cerro Zamora, vicinity of El Milagro, 22 Aug 1930, *H.H. Bartlett 11096 "a"* (HOLOTYPE: CAS!).

Lupinus omalophyllus C.P. Smith, *Sp. Lup.* 252. 1941. TYPE: MEXICO. Tamaulipas: Sierra de San Carlos, La Vegonia, vicinity of San José, 3000 ft, 2 Jul 1930, *H.H. Bartlett 10023 "c"* (HOLOTYPE: CAS!; Isotypes: *Bartlett 10023 "a", "b", "d"* [CAS!]).

Smith provided lettered subscripts to each of Bartlett's collections; I consider these to be isotypes, each being annotated by Smith as *Lupinus omalophyllus*. Technically, some purists would consider the latter collections to be paratypes, if not syntypes.

Lupinus stolidotus C.P. Smith, *Sp. Lup.* 253. 1941. TYPE: MEXICO. Tamaulipas: Sierra de San Carlos, Cerro Barril, vicinity of San José, 19 Jul 1930, *H.H. Bartlett 10479 "a"* (HOLOTYPE: not located; Isolectotype: *Bartlett 10479 "b"* [CAS!]). Holotype material was not located at CAS, where Smith's original material should be on deposit; I consider *Bartlett's 10479 "b"* to be an isotype, Smith having annotated it as "*L. stolidotus* sp. nov." in spite of the subscript "*b*" which he added to the number.

Lupinus tamaulipensis C.P. Smith, *Sp. Lup.* 153. 1941. TYPE: MEXICO. Tamaulipas: Sierra de San Carlos, Cerro Ramora, vicinity of El Milagro, 22 Aug 1930, *H.H. Bartlett 11046 "b"* (HOLOTYPE: CAS!).

Perennial herbs 30-50 cm high. Midstems densely tawny-pilose. Midstem leaves mostly 6-10 cm long; stipules 8-12 mm long, the united portion 2-4 mm

long; petioles mostly 4-6 cm long, pubescent like the stem, the longer hairs 1.5-1.8 mm long; leaflets mostly 5-7, elliptic-obovate to obovate, 3-5 cm long, 0.6-1.0 cm wide, sparsely appressed-pilose in both surfaces. Inflorescence 10-30 cm long, the flowers with pedicels 1-2 mm long. Corollas blue; standards 8-9 mm high, glabrous; wing and keel petals 8-11 mm long, the keel decidedly ciliate along the upper margins. Pods 3-4 cm long, ca. 7 mm wide, pubescent like the stems, mostly bearing 4-8 seeds; seeds blackish-white mottled, quadrangular, 3-4 mm long, 2.5-3.0 mm wide.

This taxon is clearly closely related to *Lupinus partisans* Rose having most of the characters of that species, but is readily separable from it by its tawny or rusty, long-pilose, vestiture (the longer hairs 1.5 mm long or more vs. whitish and 0.5 mm long or less).

2. *Lupinus caballoanus* B.L. Turner, *sp. nov.* TYPE: MEXICO. Nuevo León: Mpio. Santiago, vicinity of Cola de Caballo, pine-oak woodlands, "vegetación cercana a corrientes de agua. Roca sedimentaria y arenisca", 800 m, 30 Apr 1987, J.A. Villarreal & M.A. Carranza 3669 (HOLOTYPE: TEX!).

Lupino platamodi C.P. Smith similis sed racemis partibus foliaceis caulibus longioribus et vestimento trichomatus viscidipilosorum patentium (vs. non viscidorum antrorse appressorum) differt.

Perennial herbs 35-100 cm high. Stems erect, simple, or much-branched from the base when the primary stem is damaged or removed, densely viscid-pilose, the hairs mostly 0.5-1.0 mm long and spreading at right angles to the stem. Midstem leaves mostly 8-10 cm long; stipules linear-lanceolate, fused below for ca. 1 mm, the free portions 6-10 mm long; petioles 5-7 cm long, pubescent like the stems; leaflets 5-7, oblanceolate, 2-4 cm long, 0.8-1.2 cm wide, appressed-pilose on both surfaces. Inflorescence 20-40 cm long, longer than the leafy part of the stems, the pedicels mostly 3.5-4.5 mm long, pilose like the stems. Corollas blue; banner 9-12 mm long, glabrous; wing and keel petals 10-15 mm long, the keel ciliate along the upper margins. Pods ca. 3 cm long, 0.7 cm wide, 3-5 seeded, pilose with ascending hairs 1-2 mm long; seeds brown-mottled, ca. 3.5 mm long, ca. 3.0 mm wide. Chromosome number, from 3 populations, $n = \text{ca. } 24$ pairs (*Ferguson 9, 10, 11*; TEX).

ADDITIONAL COLLECTIONS EXAMINED: MEXICO. Nuevo León: Mpio. Santiago, Cola de Caballo, oak-pine woodland, 22 Mar 1992, *Neff 7* (TEX); vicinity of Cola de Caballo, 14-15 Mar, 1994, *Ferguson 9, 10, 11* (TEX). Tamaulipas: Mpio. Hidalgo, Ej. Conrado Castillo, pine woodland, 6 Nov 1989, *Aguilar 1* (TEX).

This taxon is characterized by its elongate flexuous racemes which are equal to or longer than the leafy portions of the stem. Especially noteworthy is its

often pilose-viscid spreading vestiture which, to my knowledge, is unknown among the Mexican lupines generally.

Lupinus caballoanus is a spring-bloomer; the specimen cited from Tamaulipas (collected in November) is in a late-fruitle stage (with a flowering sprig on the same sheet!).

3. *Lupinus cacuminis* Standl., Field Mus. Nat. Hist., Bot. Ser. 22:79. 1940. TYPE: MEXICO. Nuevo León: Mpio. Galeana, summit of Cerro Potosí, Mueller 2264 (HOLOTYPE: F; Isotype: TEX!).

Dunn & Harmon (1977) have rendered an excellent description of this species, pointing out its relationship to both *Lupinus montanus* and *L. muelleri* Standl. *Lupinus cacuminis* is largely confined to alpine or subalpine habitats (3000-3400 m) and is found on the higher isolated peaks southeast of Saltillo, and on Cerro Potosí (Figure 1). It is represented by numerous sheets at LL, TEX and is a fall-bloomer.

4. *Lupinus havardii* S. Wats., Proc. Amer. Acad. Arts 17:369. 1882. TYPE: U.S.A. Texas: Presidio Co., hills near Presidio, May 1881, V. Harvard s.n. (HOLOTYPE: GH!).

This biennial species resembles *Lupinus texensis* but is readily distinguished from the latter by its more robust habit, more elongate racemes, and larger leaflets which are pubescent on both surfaces. *Lupinus havardii* was first described from the Big Bend region of trans-Pecos, Texas, and is largely confined to that area and closely adjacent México. Chromosome counts are not available for *L. havardii*, but these are likely to be $2n = 18$ pairs since the taxon seems closely related to *L. texensis*.

5. *Lupinus hintoniorum* B.L. Turner, *sp. nov.* TYPE: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro El Viejo, 2590 m, "Llano" forming "dense colonies," 2590 m, 17 Jun 1993, G.B. Hinton et al. 22936 (HOLOTYPE: TEX!; Isotypes: CAS!, MEXU, NY!).

Lupino potosino Standley similis sed plants robustioribus racemis majoribus floribus majoribus ferentibus et vexilli pagina dorsali manifeste pubescentis (vs. glabri) differt.

Stiffly erect suffruticose herbs 0.6-1.5 m high. Midstems 4-5 mm across, finely appressed-strigose. Midstem leaves mostly 9-15 cm long; stipules united for 4-10 mm at the base, the free portions linear-lanceolate, 8-20 mm long;

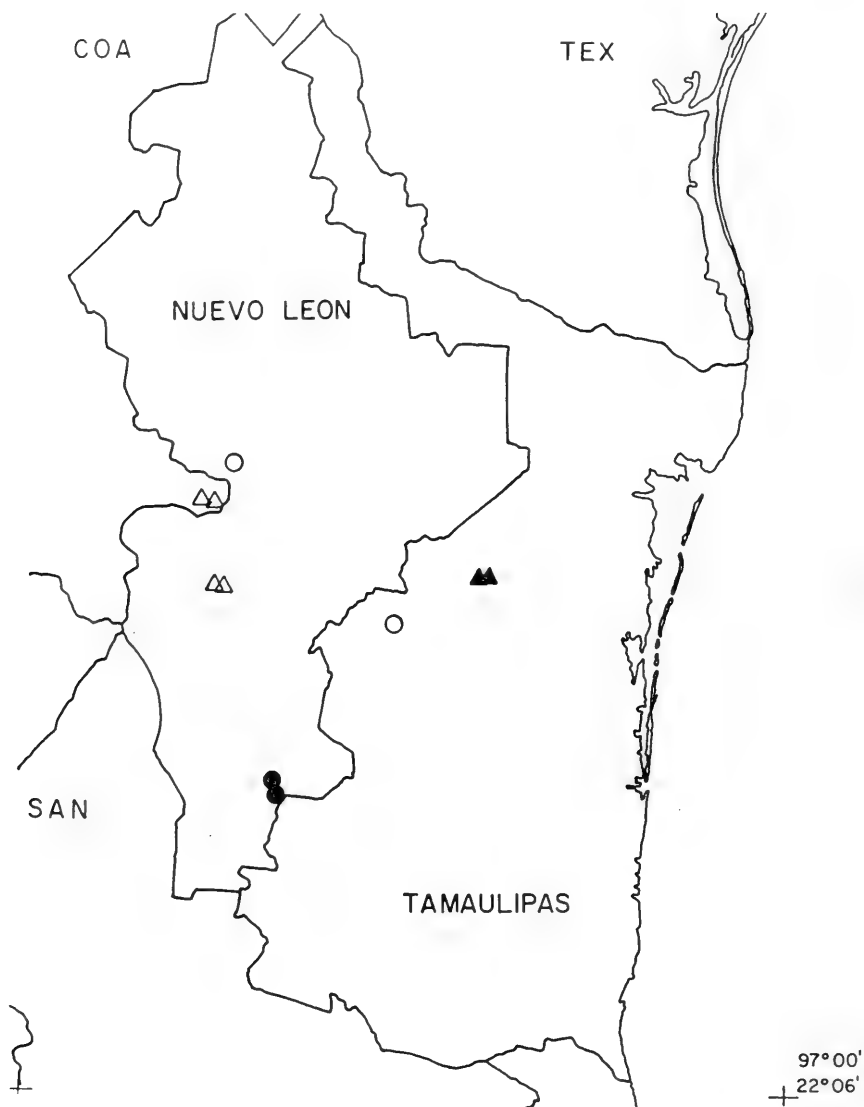


Figure 1. Distribution of *Lupinus* species: *L. bartlettianus* (closed triangles), *L. caballoanus* (open circles), *L. cacuminis* (open triangles), and *L. hintoniorum* (closed circles).

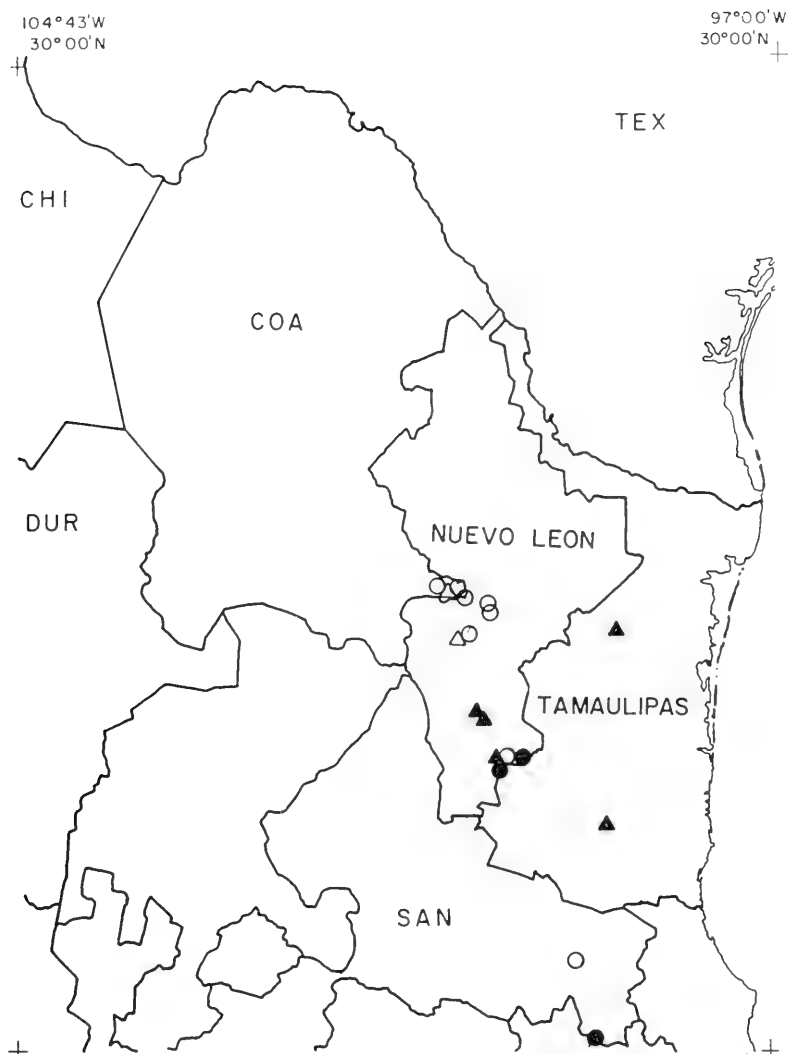


Figure 2. Distribution of *Lupinus* species: *L. muelleri* (open triangles), *L. platamodes* (closed triangles), *L. partisans* (open circles), and *L. stipulatus* (closed circles).

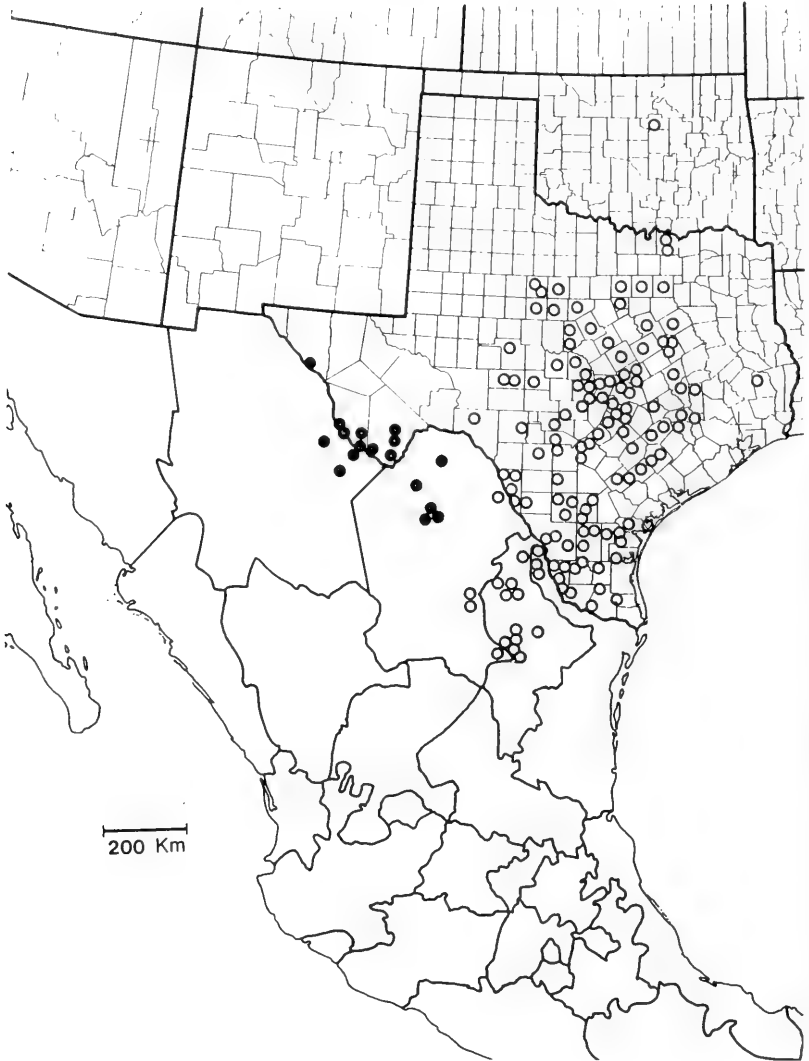


Figure 3. Distribution of *Lupinus havardii* (closed circles) and *L. texensis* Hook. (open circles).

leaflets mostly 7-9, linear-elliptical to linear-oblongate, 5-8 cm long, 1.0-1.5 cm wide, moderately and finely appressed-strigose on both surfaces, widest at or near the middle. Inflorescence mostly 20-35 cm long with numerous flowers, the pedicels mostly 8-10 mm long. Corollas described as blue, purple, white and purple, or "snow white"; banner 10-14 mm long, pubescent dorsally near the apex; wing and keel petals 12-15 mm long, the keel ciliate along the upper margins. Pod 4-5 cm long, 4-6 seeded, ca. 0.8 cm wide, sparsely and finely appressed-strigose with short hairs; seeds (immature), seemingly not mottled, ca. 5 mm long, 4 mm wide.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Aramberri, Cerro El Viejo, 2040 m, 20 Feb 1993, *Hinton et al.* 22657 (NY, TEX); Cerro El Viejo, 25 May 1993, 2580 m, *Hinton et al.* 22840 (CAS, TEX); Mpio. Zaragoza, La Encantada, 2540 m, 8 Feb 1989, *Hinton et al.* 19329 (TEX); Cerro Viejo, 2440 m, 22 Sep 1993, *Hinton et al.* 23456 (TEX); Cerro El Viejo, 2660 m, 23 Jun 1993, *Hinton et al.* 22967 (NY, TEX); Cerro El Viejo, 2650 m, 23 Jun 1993, *Hinton et al.* 22972 (NY, TEX); trail from Cañada La Tinaja to Rancho La Encantada, 2600-2700 m, 4 Jul 1988, *Patterson* 5863 (MEXU, TEX).

This species is represented by a large suite of lovely collections from Cerro Viejo and vicinity assembled by the Hinton family, mostly during spring or early summer, their principal flowering periods. Because of their beautiful assemblage I have named this taxon for the Hinton family, fully aware that there already exists a *Lupinus hintonii* C.P. Smith, from the southwestern portions of México named for the late G.B. Hinton, patriarch of this exceptional botanical lineage.

Lupinus hintoniorum superficially resembles *L. partisans* Rose, a widespread species readily distinguished from the former by its smaller habit, smaller leaflets, shorter inflorescences and glabrous banners. While described as robust and erect, it should be noted that one of the Hinton labels (23456, cited above) gives the habit as "decumbent" (apparently the stems had been stepped upon, appressing these to the ground).

6. *Lupinus muelleri* Standl., Publ. Field Mus. Nat. Hist., Bot. Ser. 22:80. 1940. TYPE: MEXICO. Nuevo León: Cerro Potosí, Las Canoas, 17 Jul 1935, *C.H. Mueller* 2205 (HOLOTYPE: F; Isotype: TEX!).

This taxon is treated and neatly described by Dunn & Harmon (1977). It is closely related to *Lupinus partisans* but appears to occur at generally higher elevations (2700-3200 m) in pine forests and seems readily distinguishable from that species by its smaller leaves and pubescent banner.

7. *Lupinus platamodes* C.P. Smith, *Sp. Lup.* 254. 1941. TYPE: MEXICO Tamaulipas: Sierra de San Carlos, near crest of range above Mesa de Tierra, near San José, 12 Jul 1930, *H.H. Bartlett 10268* (HOLOTYPE: CAS!).

Perennial herbs 20-50 cm high. Midstems ascending pilose to strigose, the hairs white or silvery. Midstem leaves mostly 5-11 cm long; stipules separate to the base or nearly so, 5-11 mm long; petioles mostly 4-7 cm long; leaflets 5-7, oblanceolate, mostly 3.5-6.0 cm long, 1.0-1.5 cm wide, sparsely appressed-pubescent on both surfaces. Inflorescence 10-12 cm long, the flowers on pedicels 2-4 mm long. Corollas purple to blue; standards 9-12 mm high, glabrous or a few hairs present dorsally; wings and keel petals mostly 10-13 mm long, the keel ciliate along the upper margins. Pods 3-4 cm long, 0.7-0.8 cm wide, moderately appressed-pilose, mostly bearing 4-7 seeds; seeds grayish-white mottled, quadrangular, 3-4 mm long, 2.5-3.5 mm wide.

This taxon is closely related to *Lupinus caballoanus* but is readily distinguished by its ascending nonviscid pubescence (vs. spreading-viscidulous) and generally smaller flowers on shorter racemes (10-12 cm long vs. 15-30 cm).

In addition to the type, following specimens have been examined. MEXICO. Nuevo León: Mpio. Aramberri, Cerro El Viejo, 1695 m, 28 Jul 1993, *Hinton et al. 23201* (TEX); La Escondida to Josecito, 1670 m, 13 Nov 1993, *Hinton et al. 23925* (TEX).

8. *Lupinus partisans* Rose, *Contr. U.S. Natl. Herb.* 8:309. 1905. TYPE: MEXICO. San Luis Potosí: Alvarez, 28 Sep-3 Oct 1902, *E. Palmer 191* (HOLOTYPE: US).

This taxon is closely related to *Lupinus hintoniorum* (from within our region) and *L. elegans* H.B.K. (from regions to the south). *Lupinus partisans* is relatively widespread and variable, according to annotations of the late D.B. Dunn, and citations by C.P. Smith, occurring from the states of Durango to Morelos along the western portions of México, and in eastern México from Coahuila to Puebla. Occasional plants from the more northern parts of its range may have a few hairs on their banners (e.g., *Hinton 28850* [TEX], from Arteaga, Coahuila); perhaps such hairs are the result of occasional hybridization of *L. partisans* with *L. muelleri* in this region, the latter possessing hairs on its banner.

9. *Lupinus stipulatus* Agardh, *Syn. Gen. Lupin.* 23. 1835.

This taxon is readily recognized from among species in northeastern México by its relatively small flowers, the banner poorly developed and shorter than

the wing and keel petals. The species is known to me in the region concerned by only two collections from Nuevo León, as follows (one of these annotated by D.B. Dunn as *Lupinus stipulatus* var. *exilis* C.P. Smith): Mpio. Zaragoza, below La Encantada, ca. 2700 m, 26 Jun 1978, *Hinton et al. 17420* (TEX); Mpio. Zaragoza, Cerro El Viejo, edge of cornfield, 2365 m, 4 Aug 1993, *Hinton et al. 23918* (TEX).

10. *Lupinus texensis* Hook., Bot. Mag. 63, t. 3492. 1836.

Lupinus leonensis S. Wats., Proc. Amer. Acad. Arts 7:338. 1882. TYPE: MEXICO. Nuevo León: "At Guajuco", which is Villa Santiago today, a village ca. 27 mi SE of Monterrey, 8 Mar 1880, *E. Palmer 198* (HOLOTYPE: GH!).

As indicated in Figure 3, *Lupinus texensis* extends into México as far south as Monterrey, Nuevo León. I can find no compelling characters which might distinguish *L. leonensis* from *L. texensis*, the former reputedly occurring from central Nuevo León and adjacent Coahuila northwards to the Texas border. Furthermore, *L. texensis* is one of only two species of *Lupinus* in North America with chromosome counts of $n = 18$ pairs (Turner 1957). To determine if Mexican material referable to *L. leonensis* might not also be $n = 18$, the following collections were examined for their meiotic chromosome numbers; all proved to be diploid with $n = 18$ pairs. [Nuevo León: Mpio. Santiago, Santiago, SE of Monterrey in canyon La Boca of Sierra La Silla, 14 Mar 1994, *Ferguson 8* (TEX); Mpio. Higuera, Cuesta Mamulique, 17 Mar 1994, *Ferguson 16* (TEX); Mpio. Higuera, Cuesta Mamulique, 17 Mar 1994, *Ferguson 18* (TEX); Mpio. Bustamante, below Grutas de Bustamante, 18 Mar 1994, *Ferguson 24* (TEX).]

The above vouchers for chromosome counts (indeed, most of the collections from northeastern México which I assign to *Lupinus texensis*) differ somewhat from "typical" *L. texensis* as it occurs in central Texas in having a stiffly erect, less bushy habit, generally longer racemes (mostly 10-25 cm long vs. 5-15 cm long) with more gradually tapering apices (vs. abruptly tapered apices), and mostly larger flowers (wing petals 10-14 vs. 8-12 mm long). In Texas, *Lupinus texensis* typical occurs in deep calcareous or silty-clay soils, while in northern México, the species occurs in shallow calcareous soils, both along roadsides and in native brushland (mesa tops, etc.). Since the characters which might distinguish these are variable, both within and between populations over a fairly large area in southern Texas and northern México, and especially since the chromosome number of all such populations are $n = 18$ pairs, I have opted to not treat the Mexican population as varietally distinct, as might be suggested by the distribution of characters listed above. The only other species in the U.S.A., so far as known, with chromosome counts of $n = 18$ pairs is *L. subcarnosus* Hook., but the latter is clearly specifically distinct since it does

not intergrade or hybridize with the *L. texensis*, even when occurring with it (Turner 1957). This seems not to be so with the proposed *L. leonensis*, which would appear to fall readily under the fabric of an enlarged *L. texensis*, although future workers may opt to treat these as varietal categories, there being intergradations of the characters concerned in the border regions of Texas/México.

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnoses, and to him and T.P. Ramamoorthy for reviewing the paper. Special thanks are due Ms. Cathy Ferguson and Mark Mayfield for collecting bud material, to Mr. Z.-M. Zhao for counting the chromosomes, and to CAS and GH for the loan of critical types.

LITERATURE CITED

- Dunn, D.B. 1981. *Lupinus*, In *Flora Fanerogamica del Valle de México*. Vol. 1. (J. Rzedowski & G.C. Rzedowski, eds.). México City, D.F.
- & W.E. Harmon. 1977. The *Lupinus montanus* complex of Mexico and Central America. *Ann. Missouri Bot. Gard.* 69:340-365.
- McVaugh, R. 1987. *Lupinus*, In *Flora Novo-Galiciana*. 5:580-599. University of Michigan Press, Ann Arbor, Michigan.
- Smith, C.P. 1938-1953. *Species Lupinorum* 1-768 [in 44 signatures or "papers"]; published by the author 1938-1953.
- Turner, B.L. 1957. The chromosomal and distributional relationships of *Lupinus texensis* and *L. subcarneus* (Leguminosae). *Madroño* 14:13-16.

GILIA JACENS (POLEMONIACEAE): SPECIES OR SUBSPECIES?

Verne Grant

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

Gilia jacens (*Gilia* section *Arachnion*, Polemoniaceae) has recently been reduced to a subspecies of *G. brecciarum* on morphological evidence. It is agreed that this evidence indicates a relationship between *G. jacens* and *G. brecciarum*. A different interpretation of the morphological evidence, however, is consistent with the original view that *G. jacens* is a separate species related, also, to *G. tenuiflora*. Data from artificial crosses point to the same conclusion. It is suggested that *G. jacens* could be a product of recombinatorial speciation from a hybrid of *G. tenuiflora* \times *G. brecciarum*.

KEY WORDS: *Gilia jacens*, *Gilia brecciarum* subsp. *jacens*, *Gilia* section *Arachnion*, speciation, Polemoniaceae

Gilia jacens A. & V. Grant is an autogamous diploid ($x = 9$) annual belonging to *Gilia* section *Arachnion* or the cobwebby gilies. It was originally described as a species (Grant & Grant 1960, p. 437). Day (1993b, p. 332) has recently reduced it to a subspecies of *G. brecciarum* M.E. Jones (*G. brecciarum* subsp. *jacens* [A. & V. Grant] Day). She lists it as such in her valuable treatment of the genus in *The Jepson Manual* (Day 1993a; Hickman 1993).

The most recent treatment by an authority on a group is usually followed by other taxonomists. In this case, however, the evidence in favor of species status is much stronger than the arguments for subspecies status, as I shall attempt to show.

In morphology, *Gilia jacens* resembles *G. tenuiflora* Benth. in flower shape and color, *G. brecciarum* subsp. *brecciarum* in branching habit and flower size, and *G. leptantha* Parish in leaf dissection. Its characters thus suggest relationships to three other diploid ($x = 9$) species of cobwebby gilia in the same area, as noted in the original description of 1960. It possesses its own unique character combination, however, which was and is one reason for treating it as a species.

Geographically, *Gilia jacens* is a narrow endemic in the arc of mountain ranges bordering the south end of the Central Valley of California. Its range lies to the south of *G. tenuiflora*. It overlaps broadly with *G. brecciarum* subsp. *brecciarum* in the southern part of its area. The two taxa occur sympatrically without losing their identity in the Inner South Coast Range. Typical *G. jacens* and typical *G. brecciarum* subsp. *brecciarum* were found growing one mile apart on the lower north slope of the Mt. Pinos range. This is evidence for treating them as separate species.

Extensive evidence concerning crossability, hybrid fertility, and chromosome homologies among diploid taxa of *Gilia* section *Arachnion* was obtained years ago by Day and myself (Grant & Grant 1960) (A. Grant was the former name of A. Day). This evidence shows that *G. jacens* belongs to the *G. tenuiflora* fertility and genome group. The group contains seven diploid species. Artificial hybrids between *G. jacens* and other species of the group including *G. tenuiflora* proper are semisterile as to pollen and seeds. The hybrids show moderately reduced chromosome pairing and other irregularities at meiosis, indicating that the species possess different subgenomes of a common *T* genome (Grant & Grant 1960). Thus, *G. jacens* is related to *G. tenuiflora*, but is isolated from it by internal barriers of moderate strength.

The crossing evidence indicates that *Gilia brecciarum* together with *G. diegensis* (Munz) A.D. Grant & V. Grant form another fertility group, the *G. brecciarum* group. Five species of the *G. tenuiflora* group were intercrossed with the two species of the *G. brecciarum* group. Strong incompatibility barriers were found in all hybrid combinations. Most crosses attempted between the two groups produced abortive seeds, some inviable plump seeds, and no F_1 individuals. One cross produced abundant plump seeds which were apparently mostly inviable since they yielded only three F_1 plants. These plants had 11-14% good pollen (Grant & Grant 1960).

Although *Gilia jacens* was not one of the five species tested against the *G. brecciarum* group, the best inference until such a test is made is that it too is isolated by internal barriers from *G. brecciarum*.

Day (1993b) cites two lines of evidence for reducing *Gilia jacens* to a subspecies. First, it shares more morphological characters with *G. brecciarum* subsp. *brecciarum* than was realized formerly. Second, intermediates between *G. jacens* and *G. brecciarum* subsp. *brecciarum* occur in the Tehachapi and Piute mountains. The latter type of evidence suggests that the two taxa hybridize locally in their zone of overlap, which is consistent with the view that they are species.

Day (1993b) mentions but downplays the morphological similarities and fertility relationships between *Gilia jacens* and *G. tenuiflora*. She does not mention the sympatric coexistence of *G. jacens* and *G. brecciarum*, nor does she consider the strong incompatibility barriers between the *G. tenuiflora* and *G. brecciarum* groups.

Alva Day and I discussed many taxonomic questions concerning *Gilia* during the period when she was working on this genus for *The Jepson Manual*, but unfortunately *G. jacens* was not one of them. The change to *G. brecciarum* subsp. *jacens* was in print before we had a chance to discuss the pros and cons. Such a discussion is now underway.

Is it important whether the taxon *jacens* is treated as a species or subspecies, and if so, why? The *Gilia tenuiflora* group has produced three narrowly endemic species in the mountains at the southern end of the California Central Valley (*G. jacens*, *G. austro-occidentalis* [A.D. Grant & V. Grant] A.D. Grant & V. Grant, and *G. interior* [H. Mason & A.D. Grant] A.D. Grant). This is significant from the standpoints of phytogeography and speciation.

Gilia jacens and the related *G. austro-occidentalis* have been presented as cases of rapid diploid speciation involving autogamy, inbreeding, and adaptation to new environmental conditions (Grant 1971, 1981). I suggested earlier that *G. jacens* was a derivative of the parental species *G. tenuiflora* (Grant 1971, 1981). I would retain but modify this hypothesis now in the light of Day's (1993b) evidence of a hybrid relationship between *G. jacens* and *G. brecciarum* subsp. *brecciarum*. We should consider the possibility that *G. jacens* is a product of recombinatorial speciation (see Grant 1981) from two parental species, *G. tenuiflora* and *G. brecciarum* subsp. *brecciarum*. This is a hypothesis that can be tested experimentally.

ACKNOWLEDGMENTS

Dr. Alva Day and Dr. Billie L. Turner discussed the problem with me and read the manuscript. It is a pleasure to acknowledge their help.

REFERENCES

- Day, A.G. 1993a. *Gilia*. Pp. 838-849 in J.C. Hickman (ed.), *The Jepson Manual, Higher Plants of California*. University of California Press, Berkeley, California.
- . 1993b. New taxa and nomenclatural changes in *Allophyllum*, *Gilia*, and *Navarreta* (Polemoniaceae). *Novon* 3:331-340.
- Grant, V. 1971. *Plant Speciation*. 1st ed. Columbia University Press, New York, New York.
- . 1981. *Plant Speciation*. 2nd ed. Columbia University Press, New York, New York.

- & A. Grant. 1960. Genetic and taxonomic studies in *Gilia* XI. Fertility relationships of the diploid cobwebby gilias. *Aliso* 4:435-481.
- Hickman, J.C. (ed.). 1993. *The Jepson Manual, Higher Plants of California*. University of California Press, Berkeley, California.

OBSERVATIONS ON DISTRIBUTION, ABUNDANCE, AND HABITATS OF
SIDALCEA NELSONIANA PIPER (MALVACEAE) IN OREGON

Judith B. Glad

1400 N Holman, Portland, Oregon 97217 U.S.A.

Richard R. Halse

272 SE Viewmont Ave., Corvallis, Oregon 97333 U.S.A.

&

Richard Mishaga

CH2M HILL, Inc., 825 NE Multnomah, Suite 1300, Portland, Oregon 97232
U.S.A.

ABSTRACT

The distribution, abundance, and habitats of *Sidalcea nelsoniana* were studied throughout its range for seven growing seasons (1985-1991). The US Fish and Wildlife Service (1993) recently listed the species as Threatened; the State of Oregon listed it as Threatened in 1989. In early 1985, only a few extant sites were known and the published habitat information was scant and contradictory. The authors conducted systematic searches for new sites, made exact counts or statistical estimates of the numbers of individual plants at each site, observed the relative proportions of pistillate-flowered and perfect flowered plants in most populations, and identified the taxa most commonly associated with *Sidalcea nelsoniana*. Soil sampling showed that the species tolerated a range of soil textures and moisture levels. *Sidalcea nelsoniana* was most commonly found in association with early to mid-seral species in four habitats: ruderal, valley woodlands, wet meadows, and mountain meadows, in the Coast Range and the Willamette Valley of Oregon. At the conclusion of the 1991 field season, 48 sites containing an estimated 24,158 plants were known. *Sidalcea nelsoniana* has been found to be somewhat more widely spread than previously reported, as

well as considerably more abundant. It now occupies a broad variety of habitats. This ability, coupled with federal and state protection, could assure its survival.

KEY WORDS: *Sidalcea nelsoniana*, Malvaceae, threatened species, Oregon

INTRODUCTION

Nelson's checker-mallow (*Sidalcea nelsoniana* Piper [Malvaceae]), a gynodioecious, rhizomatous perennial, is found in western Oregon and Washington, from southern Benton County, Oregon, north to Cowlitz County, Washington (CH2M HILL 1991; Halse & Glad 1986; Halse *et al.* 1992). The species was first collected in 1871 and was described 48 years later (Piper 1919). In the first Oregon list of rare, threatened, and endangered species, Siddall *et al.* (1979) included *Sidalcea nelsoniana* in the endangered category with the comment, "... known only from two small populations, both along roadsides." The species is listed as threatened by both the U.S. Fish and Wildlife Service (1993) and the State of Oregon (Oregon Administrative Rules 603-37-070). Before this study began, the Oregon Natural Heritage Data Base (ONHDB 1984) reported some twenty-four extant or historical sites apparently supporting the species; plants at some sites were thought to be hybrids.

Prior to this study, published accounts of *Sidalcea nelsoniana* habitat were often confusing and contradictory. Roush (1931) commented that members of the genus are mesophytes, found in moist sites in mesic regions or in moist but soon desiccated sites in arid regions. Hitchcock (1957) and Hitchcock & Cronquist (1961, 1973) stated that the species occurs in more or less gravelly, well-drained soil. Peck (1961) wrote that *Sidalcea nelsoniana* is found on moist, open ground and in thickets.

Sidalcea nelsoniana was discovered at Walker Flat, western Yamhill County, in late summer 1984. Walker Flat was then under investigation as the site for a proposed water supply reservoir. Studies were initiated in 1985 to determine its abundance, distribution, and habitat preference. Investigations of *Sidalcea nelsoniana* at Walker Flat were discussed in Glad *et al.* (1987). This paper describes the results of seven years of surveys monitoring the species' status throughout its known range.

METHODS

The authors examined all available aerial photographs of the Coast Range and Willamette Valley north of 44°15' north latitude and east of 110° west longitude. Open areas in the Coast Range that appeared similar to Walker Flat

in vegetation, topography, and soil moisture were noted for further investigation. Selection of sites to be examined in the Willamette Valley was based on scanty habitat information available in Hitchcock (1957), Hitchcock & Cronquist (1961, 1973), Meinke (1982), ONHDB (1984), and Peck (1961). They included valley woodlands dominated by *Fraxinus*, abandoned fields, moist meadows and primary drainages, and wide roadside ditches, except where recent development or changes in land use had made them unsuitable as *Sidalcea nelsoniana* habitat. A helicopter was used to examine sites not easily accessible by road and sites scattered along the periphery of the valley.

Once sites were identified as potential *Sidalcea nelsoniana* habitat, they were searched by at least two individuals, walking slowly in parallel paths 2 m to 5 m apart (depending on height of vegetation), until the entire area delineated on the aerial photograph was inspected. Sites where *Sidalcea nelsoniana* was found were marked on maps. Searches of potential new sites took place primarily in 1985 and 1986, and thereafter only as new potential sites were identified. Occasionally land use changes or other circumstances indicated areas adjacent to known populations that warranted investigation, thus expanding the outer boundaries at some sites.

Sidalcea nelsoniana is rhizomatous, making determination of individual plants difficult. Study personnel and representatives of the U.S. Fish and Wildlife Service and the Bureau of Land Management agreed, before the initiation of 1987 field studies, that a single plant was contained within 1 m diameter circle. This definition was supported by earlier excavation of *Sidalcea nelsoniana* rhizomes in both the Willamette Valley and the Coast Range. Where two sexes were present, pistillate and perfect flowered plants were counted separately. The counts were not subjected to statistical treatment.

Plant counts took place at all but two sites annually from 1985 through 1990. In 1991 plant counts were done only at newly discovered sites and those which had undergone disturbance since the previous count. Where no apparent changes had occurred, it was assumed that the size of the population remained the same.

The sizes of the two largest Coast Range populations were estimated by statistical sampling. All potential *Sidalcea nelsoniana* habitat at Walker Flat and Tillamook Burn 1 was mapped. A grid pattern was used to sample one-meter-square quadrats. The random stratified sampling included between one and three percent of the total quadrats at each site. The frequency of *Sidalcea nelsoniana* was determined as a percent of quadrats containing at least one stem. Multi-stemmed *Sidalcea nelsoniana* within a quadrat was assumed to be a single plant. If plants of different sexes were observed within a quadrat, two plants were tallied. The upper and lower 95 percent confidence limits for estimates were calculated by the exact distribution method (Steel & Torrie 1980).

In 1987 all known populations of *Sidalcea nelsoniana* were examined to de-

termine the relative numbers of pistillate-flowered and perfect-flowered plants. Except at Walker Flat, all the flowering pistillate-flowered and perfect-flowered plants present were counted. At Walker Flat, 77 randomly selected plants were checked. Ratios of pistillate-flowered to perfect-flowered plants were calculated.

Quantitative sampling of vascular plant cover was done at each site in 1986. One to five 1 m² quadrats were centered on *Sidalcea nelsoniana* plants, the number of plots being determined by the vegetative diversity and areal extent of the site. We estimated relative (canopy) cover of all vascular plant taxa present within the quadrat. Slope, aspect, other physical characteristics of each site, and other plant taxa present but not occurring within the quadrats were recorded.

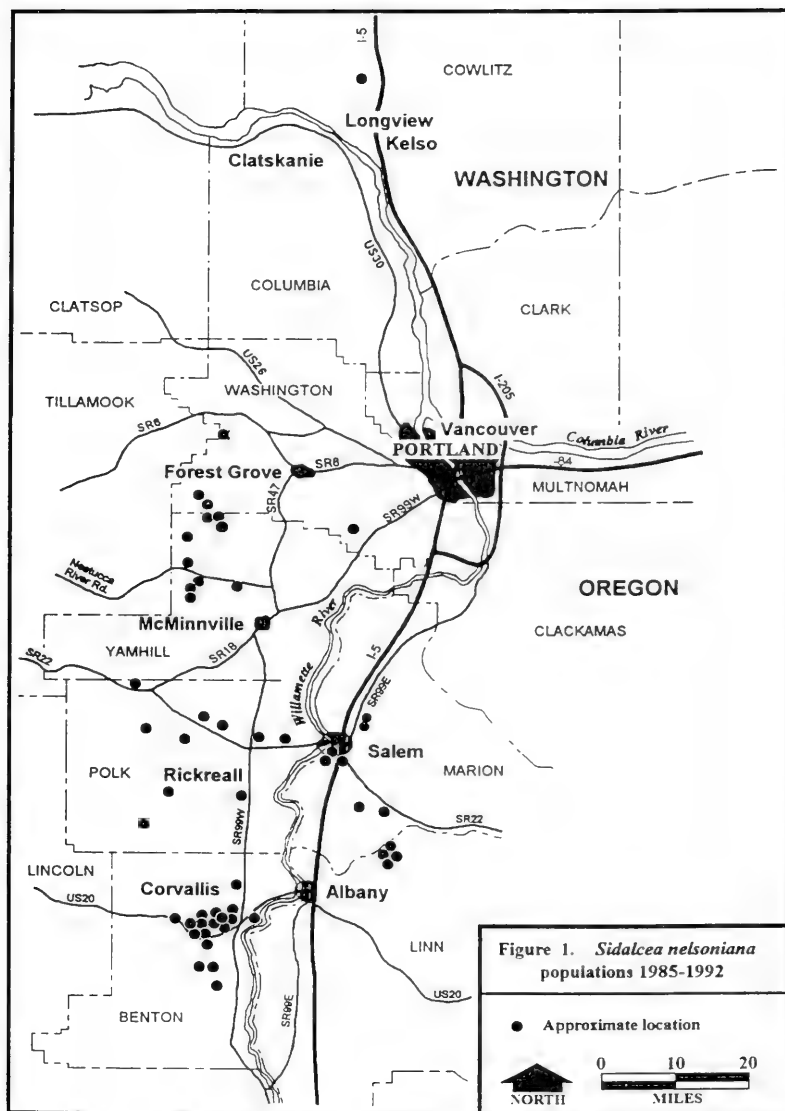
Soil samples were taken at 25 populations in July, 1986, to determine soil texture and hydricity. Each was taken within 15 cm of a *Sidalcea nelsoniana* plant, at a depth of 30 cm. Soil color was determined by comparison with a Munsell color chart and depth to mottling was recorded.

A qualitative comparison of all Willamette Valley *Sidalcea nelsoniana* sites resulted in our dividing them into four habitat categories: ruderal sites (weedy, with evidence of recent or continuing disturbance), wet meadows (with soils moist into early summer), valley woodlands (mixed stands of *Frazinus*, *Quercus*, and other trees and shrubs), and mountain meadows (grassy areas in montane valleys). Some sites included more than one habitat category.

RESULTS AND DISCUSSION

More than 1,000 sites potentially capable of supporting *Sidalcea nelsoniana* were identified in the course of this study. Approximately half of those sites were searched intensively; the remaining sites were unsuitable *Sidalcea nelsoniana* habitat because of land use, topography, or extant vegetation (e.g., dense *Rubus* thickets, heavy tree cover). Between 1986 and 1991, we found and documented 30 previously undiscovered sites of *Sidalcea nelsoniana*.

At the beginning of this study, 24 possible sites were listed by ONHDB (1984) as supporting *Sidalcea nelsoniana*. Examination of herbarium specimens or field inspection showed five sites to contain only other *Sidalcea* species. Nine of the sites could not be located; the collections had taken place 20 to 70 years previously, and in most cases, original collection data were inadequate to determine exact locations. *Sidalcea nelsoniana* had been destroyed at one site. The remaining nine listed "sites" occurred from Benton County to Yamhill County, with three at Finley National Wildlife Refuge (NWR). We found no evidence of hybridization at any site (Halse *et al.* 1989). Figure 1 shows approximate locations of historical sites where *Sidalcea nelsoniana* is no longer found, and of sites where the species has been found or confirmed since 1985.



Sidalcea nelsoniana site counts for 1985 through 1991 are summarized in Table 1. In 1985, we searched 22 sites supporting *Sidalcea nelsoniana* and counted 4,781 plants. In 1986, 1987, and 1988, there were 32 sites supporting *Sidalcea nelsoniana*. The species occurred at 39 sites in 1989, at 44 sites in 1990. In 1991, 24,158 plants were estimated to be present at 48 sites, assuming no changes in plant numbers at undisturbed sites since the last count. All of the plants occurred naturally.

The annual increases in plant numbers shown on Table 1 can be attributed to three factors. There was an increase of the search area at many sites as we learned more about *Sidalcea nelsoniana*'s habitat occurrence (e.g., Devils Lake Fork, Burkland Lumber). As we gained increased experience in finding *Sidalcea nelsoniana* plants, we recognized plants at new sites during other activities. There was also natural increase by both vegetative and sexual reproduction. Seedlings were seen at almost all sites during the course of this study and vegetative expansion of plants was also noted at many sites (e.g., Nelson's Golden Valley, Meadow Lake, OSU Turkey Farm, Finley NWR). Decreases usually appeared to result from human activities. Agents of disturbance included vegetation control, particularly mowing (e.g., SR22, SR99), herbicide application (e.g., Panther Creek, OSU Horse Center), and mechanical brush removal (e.g., Monmouth, OSU Turkey Farm). Other sites were affected by mowing, cultivation, and construction (e.g., Salem Airport, Dallas). Four sites (e.g., Monmouth, Mount Jefferson) were completely destroyed.

Sidalcea nelsoniana occurs on both moist sites and sites which become desiccated in the summer. Contrary to other reports (Meinke 1982; ONHDB 1984), it is not restricted to native prairie remnants or wetlands. The species was found to be widespread in the Willamette Valley and to occur at ten sites in the Oregon Coast Range as well, rather than being restricted to "a handful of populations ... [all but one] along roads" (Meinke 1982).

Physical site data and cover sampling showed that *Sidalcea nelsoniana* is not consistently associated with any identifiable plant community or habitat. The species was found in association with 111 taxa; at least 48 of these are aliens (CH2M HILL 1986). About one-half of the commonly associated species (frequency >10% in sampled quadrats) were aliens; only five taxa (*Agrostis* spp., *Cirsium* spp., *Festuca* spp., *Vicia* spp., and *Holcus lanatus* L.) occurred more than 25 percent of the time.

Sidalcea nelsoniana is a gynodioecious species, which means that individual plants are either perfect-flowered (hermaphrodites) or pistillate-flowered (female). Table 2 lists the number of plants counted and the number of non-flowering, pistillate-flowered, and perfect-flowered plants at 32 sites in 1987. Thirty of the sites had plants in flower at the time of the survey; two sites (Wendland Farm and Monmouth) had none. There were 6,517 plants counted. Twenty-six percent (1,721) were not in flower. Of the remaining 4,796 plants, 58 percent were pistillate-flowered and 42 percent were perfect-flowered. There

TABLE 1. NUMBER AND LOCATION OF *SIDALCEA NELSONIANA* PLANTS IN WESTERN OREGON, 1985-1991

Site	1985	1986	1987	1988	1989	1990	1991
Benton County, Oregon							
Bald Hill Park	30 ₁	132 ₁	168 ₁	234 ₁	227 ₁	346 ₁	346 _b
Bellfountain Road	.	.	.	.	.	.	6 _b
Decker Road	.	.	.	.	.	7	7
Dixon Creek	2	0	0	0	0	0	0 _b
Finley NWR	294 ₁	1,288 ₁	1,368 ₁	1,831 ₁	2,351 ₁	2,366 ₁	2,366 _b
Industrial Way	.	.	.	.	.	24	24 _b
Lewisburg	.	.	173	188	162	198	198 _b
OSU Horse Center	.	290	342	402	408	656	656 _b
OSU Turkey Farm	427	690	995	1,611	1,586	1,784	1,784 _b
Philomath	3	11	9	9	13	21	21 _b
Philomath North	2 ₁	2 ₁	2 ₁	2 ₁	0	1	1 _b
Reservoir Road	.	.	.	.	.	.	1 _b
Squaw Creek	.	.	.	.	56 ₁	70	70 _b
Starker Park	.	.	.	.	.	49	49 _b
Walnut Park	8 ₁	5 ₁	2 ₁	4 ₁	4	4	4 _b
Water Works	.	.	.	.	62 ₁	56	56 _b
Wren	.	.	.	.	.	83	83 _b
Cowlitz County, Washington							
Coal Creek	.	.	.	.	.	.	111
Linn County, Oregon							
Hess Road	30	94	76	35	90	359	359 _b
Mount Jefferson	60 ₁	60	0	0	0	0	0 _b
Ridge Drive	.	10 ₁	7 ₁	10 ₁	15	25	25 _b
Shelburn	.	.	.	.	2	2	2
Marion County							
Aumsville	7	7	10	12	14	16	16 _b
Burkland Lumber	50 ₁	50	86	104	67	158	158 _b
Fletcher Road	.	52	26	22	33	27	27 _b
KOA	.	2	1	2	2	2	2 _b
Salem Airport	321 ₁	909	1,081	1,042	1,055	1,429	1,429 _b
Walker Road	.	49	56	45	47	54	54
Wendland Farm	.	112	9	13	17	29	0
Polk County, Oregon							
Bridgeport School	6 ₁	9	9	9	11	15	15 _b
Dallas South	.	236	318	452	362	338	271 _b
Dyck Road	2 ₁	4	61	172	253	296	296 _b
McTimmonds Valley	.	689	674	902	1,184	1,333	1,333 _b
Monmouth	.	9	4	4	1	0	0
SR18	.	.	.	.	.	.	217 _b
SR22	21	72	54	70	76	58	58 _b
SR99W	12 ₁	73 ₁	60 ₁	57 ₁	60	251	251 _b
Salt Creek	.	.	.	.	143	266	266

VanWell Road	.	260	100	122	180	134	134 ^b
Tillamook County, Oregon							
Devils Lake Fork	110	110	238	285	296	285	285 ^b
Washington County, Oregon							
Lakeside	.	.	.	.	.	248	232
Second Growth	.	.	.	.	.	116	112 ^b
Waibel Farm	.	45	62	105	186	175	175 ^b
Yamhill County							
Conchy	.	.	.	.	.	.	39 ^c
Meadow Lake	50	50	247	278	356	361	361 ^b
Nelson's Golden Valley	105	384	178	176	260	195	195 ^b
Nestucca River	1	3	2	2	2	2	2
North Fork						83	167 ^b
Panther Creek	12	41	21	17	21	22	22 ^b
Tillamook Burn 1	.	.	.	.	4,460 ^c	4,460 ^b	4,460 ^b
Tillamook Burn 2	.	.	.	.	5	17 ^b	14
Walker Flat	3,228	3,228 ^b	5,689 ^c	5,689 ^b	5,449 ^c	5,449 ^b	7,398 ^b
ESTIMATED TOTALS	4,781	8,976	12,129	13,906	19,516	21,870	24,158

. Site not yet discovered.

No change in site conditions observed since last visit;
count assumed unchanged.

c A statistical estimate, not an actual count.

was only one sex of flower at four sites (Table 2). The ratio of pistillate-flowered plants to perfect-flowered plants varied from 21.5:1 at Hess Road to 0.18:1 at Waibel Farm. The overall ratio was 1.36 pistillate-flowered plants for each perfect-flowered plant (Table 2).

It was beyond the scope of this study to determine how gynodioecious polymorphism in *Sidalcea nelsoniana* is inherited and maintained, and what the effects of a gynodioecious breeding system are on the population dynamics of the species. Seedlings have never been seen at sites with only pistillate-flowered plants. Plant counts have increased at sites with both female and hermaphroditic plants where seedlings have been observed (e.g., Hess Road, Finley NWR, OSU Turkey Farm). A portion of these observed increases may be due to sexual reproduction.

Soil cores taken at larger sites in 1986 indicated that not all soils supporting *Sidalcea nelsoniana* are hydric. Soil texture samples varied from loam to clay (Table 3). Twenty-two of 41 soil core samples showed low chromas or mottling, indicative of hydric soil conditions. Eleven of the samples lacked any such indication. Six of the samples were intermediate between hydric and non-hydric in chroma and mottling. At two sampling sites (Wendland Farm and Salem Airport), data were insufficient to make a hydricity determination because the soils were so gravelly that no cores could be taken. Soils data correlated with vegetation cover data and other site observations showed that *Sidalcea nelsoniana* occupies habitats ranging from permanently wet to well

TABLE 2. RATIOS OF PISTILLATE-FLOWERED PLANTS TO PERFECT-FLOWERED PLANTS AT SIDALCEA NELSONIANA POPULATION SITES, 1987.

Population/Site	Total Plants	No Flowers	Pistillate	Perfect	Ratio
Benton County, Oregon					
Bald Hill Park	168	21	82	65	1.26:1
Finley NWR	1368	293	679	396	1.71:1
Lewisburg	173	23	93	57	1.63:1
OSU Horse Center	342	117	128	97	1.32:1
OSU Turkey Farm	995	238	414	343	1.21:1
Philomath	9	5	3	1	3.00:1
Philomath North	2	0	2	0	N/A
Walnut Park	2	0	0	2	N/A
Linn County, Oregon					
Hess Road	76	31	43	2	21.50:1
Ridge Drive	7	4	2	1	2.00:1
Marion County, Oregon					
Aumsville	10	1	6	3	2.00:1
Burkland Lumber	86	2	54	30	1.80:1
Fletcher Road	26	11	11	4	2.75:1
KOA	1	0	1	0	N/A
Salem Airport	1081	321	481	279	1.72:1
Walker Road	56	3	41	12	3.42:1
Wendland Farm	9	9	0	0	N/A
Polk County, Oregon					
Bridgeport School	9	6	1	2	0.50:1
Dallas	318	17	194	107	1.81:1
Dyck Road	61	1	26	34	0.76:1
McTimmonds Valley	674	400	175	99	1.77:1
SR22	54	12	20	22	0.91:1
Monmouth	4	4	0	0	N/A
SR99W	60	31	12	17	0.71:1
Van Well Road	100	2	62	36	1.72:1
Tillamook County, Oregon					
Devils Lake Fork	239	49	93	97	0.96:1
Washington County, Oregon					
Waibel Farm	62	16	7	39	0.18:1
Yamhill County, Oregon					
Meadow Lake	247	8	79	160	0.49:1
Nelson's Golden Valley	178	45	39	94	0.41:1
Nestucca River	2	0	2	0	N/A
Panther Creek	21	3	3	15	0.20:1
Walker Flat	77	48	7	22	0.32:1

TABLE 3. SOIL CHARACTERISTICS AT SIDALCEA NELSONIANA SITES, 1986

Sample Site/ Site Type	Depth to Mottles	Munsell Color	pH	Soil Hydricity	Disturbed?	Comments
Bald Hill Park Ruderal	None	10YR 3/2	6.5	Non-hydric	Yes	Roadside ditch; small stones in 20-30 cm zone
Bald Hill Park Valley Woodland	None	10YR 3/1	6.1	Hydric	No	Solid, very hard throughout profile
Finley NWR Valley Woodland	25 cm	10YR 5/6	6.2	Intermed.	No	On edge of gully; texture: clay
Finley NWR Valley Woodland	None	10YR 5/1	6.1	Hydric	No	0-13 cm loose, 13-30 cm compacted and clayey
Finley NWR Wet Meadow	0 cm	5YR 5/1	6.2	Hydric	No	13-30 cm soil very hard
Finley NWR Valley Woodland	None	10YR 5/3	6.1	Non-hydric	No	In ditch
Finley NWR Valley Woodland	10 cm	10YR 5/1	6.5	Hydric	No	Flat, bare areas and debris suggest periodic flooding
Finley NWR Ruderal	20 cm	10YR 5/2	6.7	Intermed.	No	Mottling very faint 20-30 cm
OSU Horse Center Valley Woodland	None	2.5YR 3/0 (13-30 cm)	5.9	Hydric	No	13-30 cm very hard black silty-clay

Sample Site/ Site Type	Depth to Mottles	Munsell Color	pH	Soil Hydricity	Disturbed?	Comments
OSU Horse Center Ruderal	None	10YR 3/1 (0-25 cm)	6.2	Hydric	No	25-30 cm hard black silty clay in grazed pasture
OSU Horse Center Ruderal	None	10YR 3/1	6.46	Hydric	No	Very hard clay-like material
OSU Turkey Farm Valley Woodland	None	5YR 3/1	6.7	Hydric	No	Uniform color in core, structure aggregated in 0-18 cm layer; texture: silty clay
OSU Turkey Farm Ruderal	None	5YR 3/1	6.5	Hydric	No	Uniform color and consistency throughout; texture: clay
Walnut Park Ruderal	None	2.5YR 2.5/0	5.1	Hydric	No	30 cm horizontally, 25 cm vertically from water level
Hess Road Valley Woodland	---	10YR 5/2	6.6	Insuf. Data	Yes	Rocky soil prevented most * measurements
Mt. Jefferson Ruderal	None	10YR 4/2	6.8	Non-hydric	Yes	Plowed; soil core has low integrity; texture: clay loam
Ridge Drive Ruderal	None	10YR 3/2	6.6	Non-hydric	No	Adjacent to railroad tracks
Aumsville Ruderal	---	5YR 3/1	6.6	Hydric	Yes	Abandoned gravel pit; rocky soil prevented most measurements

Sample Site/ Site Type	Depth to Mottles	Munsell Color	pH	Soil Hydricty	Disturbed?	Comments
Burkland Lumber Ruderal	None	10YR3/2 (0-20 cm) 7.5YR 5/0 (20-30 cm)	6.9	Hydric	Yes	Plowed in past; texture: silty clay loam
Fletcher Road Ruderal	None	10YR 3/1	6.9	Hydric	Yes	Roadside ditch; heavy clay at bottom of core
Salem Airport Ruderal	None	10YR 4/2 (0-30 cm)	7.1	Non-hydric	No	Stones in soil; 0-30 cm sample taken with trowel; texture: loam
Salem Airport Valley Woodland	---	10YR 4/2	6.9	No data	No	Stones in soil; 0-8 cm sample taken with trowel
Walker Road Ruderal	None	10YR 5/1	7.1	Hydric	No	Mapped (USGS) as intermittent streambed
Wendland Farm Ruderal	---	10YR 4/2	7.3	No data	Yes	Plowed in past; no soil core due to stones
Bridgeport School Ruderal	25 cm	10YR 4/2	6.1	Intermed.	No	Mottles very weak
Dallas South Ruderal	20 cm	10YR 4/2 (0-20 cm)	5.8	Hydric	Yes	Plowed in past; sharp transition at 20 cm
Dallas South Valley Woodland	None	10YR 4/3	5.7	Non-hydric	No	Abandoned orchard; texture: silty clay

Sample Site/ Site Type	Depth to Mottles	Munsell Color	pH	Soil Hydricity	Disturbed?	Comments
Dyck Road Ruderal	0 cm	10YR 4/4	7.0	Intermed.	No	Poorly developed mottles throughout core; texture: clay loam
McTimmonds Valley Ruderal	None	10YR 5/3	6.2	Non-hydric	No	Regenerating clearcut; texture: clay
McTimmonds Valley Ruderal	15 cm	10YR 4/3	6.5	Intermed.	Yes	Within highway right-of-way
SR22 Ruderal	None	10YR 5/3	7.0	Non-hydric	Yes	Within highway right-of-way; texture: silty clay loam
SR22 Ruderal	15 cm	10YR 5/2 (0-15 cm)	7.0	Hydric	Yes	Roadside ditch; soil appears severely disturbed
SR99W Ruderal	None	10YR 3/1	7.0	Hydric	Yes	Roadside ditch; areas of heavy clay or silt-clay in core
SR99W Ruderal	None	10YR 3/1	6.9	Hydric	Yes	Both cultivation and ditch maintenancelikely
VanWell Road Ruderal	0 cm	10YR 3/2	6.7	Hydric	No	Very sparse mottles throughout core; high clay content
VanWell Road Ruderal	None	10YR 3/2	5.0	Non-hydric	No	High clay content

Sample Site/ Site Type	Depth to Mottles	Munsell Color	pH	Soil Hydricity	Disturbed?	Comments
VanWell Road Ruderal	10 cm	10YR 4/3	6.2	Intermed.	Yes	Plowed in past; mottles only in 10-15 cm area; texture: silty clay
Devils Lake Fork Mountain Meadow	None	10YR 3/2	7.0	Non-hydric	No	Uniform color throughout core
Waibel Farm Wet Meadow	None	7.5YR 2/0	6.8	Hydric	No	Free water on surface
Nelson's Golden Valley Mountain Meadow	23 cm	10YR 3/1	6.0	Hydric	No	High clay content 23-30 cm; no roots below 23 cm
Nelson's Golden Valley Mountain Meadow	10 cm	10YR 3/2	6.9	Hydric	No	High clay content in lower part of core
Panther Creek Ruderal	None	10YR 4/2	7.1	Non-hydric	Yes	Roadside ditch; pebbles; high clay content in parts

*0-15 cm samples collected with trowel.

drained.

The four habitat categories supporting *Sidalcea nelsoniana* are ruderal sites, wet meadows, valley woodlands, and mountain meadows (Table 1).

Ruderal sites include roadsides, ditchbanks, and fallow/abandoned fields. They are characteristically weedy. Soils vary from hydric to non-hydric, and usually show extreme disturbance. Introduced pasture/forage grasses are commonly the dominant species. Examples include VanWell Road and OSU Horse Center.

Only two sites, Waibel Farm and Walker Flat, support wet meadows of any size in which *Sidalcea nelsoniana* occurs. They sometimes remain wet into early summer, depending on occurrence of spring precipitation. *Carex* spp., *Juncus* spp., *Eleocharis* sp., *Lupinus polyphyllus* Lindl., and other characteristic wetland taxa are among the plants present.

Frazinus latifolia Benth. is the dominant and often the only tree in valley woodlands (e.g., Finley NWR, OSU Turkey Farm). Understory vegetation varies considerably in species composition. *Sidalcea nelsoniana* occurs most often on the perimeters of wooded areas and within clearings. When it grows under the tree canopy, it is usually etiolated.

All Coast Range sites occupy meadows and are substantially alike in species composition and topography, although their elevations vary from about 450 m to slightly over 600 m MSL. *Sidalcea nelsoniana* in mountain meadows is subject to more severe environmental conditions than it is in the Willamette Valley, due to the higher elevations and concomitant shorter growing season. The observed proportion of sterile (i.e., non-flowering) plants was considerably higher at Coast Range sites; possibly as many as 50 percent of the plants did not produce flowers. Flowering stems were shorter than in the Willamette Valley and the inflorescences tended to be much more compact. Taxonomic investigations, however, have shown that *Sidalcea nelsoniana* is morphologically consistent throughout its range and there is no basis for dividing the species into separate taxa (Halse et al. 1989). Despite the shorter growing season in the Coast Range, flowering plants produced viable seed.

CONCLUSIONS

As a result of this study, the range of *Sidalcea nelsoniana* has been shown to be somewhat greater than previously reported. The species was also found to be much more abundant than suspected.

Sidalcea nelsoniana may have originally been part of the native valley grassland flora, but our data show it to be well adapted to ruderal habitats, in which it occurs at 79 percent of the sites, to valley woodlands (at 29 percent of the sites), and to mountain meadows (23 percent of the sites). With such a broad range of habitat requirements, and with both federal and state protection, its continued survival should be expected.

ACKNOWLEDGMENTS

Studies of *Sidalcea nelsoniana* were supported by the City of McMinnville, Oregon, Water and Light Department. We thank N. Chris Glad for computerizing and updating the figure.

REFERENCES CITED

- CH2M HILL. 1986. Studies of *Sidalcea nelsoniana*. (Report submitted to U.S. Bureau of Land Management and U.S. Fish and Wildlife Service by City of McMinnville, Department of Water and Light).
- CH2M HILL. 1991. Studies of *Sidalcea nelsoniana*. (Report submitted to U.S. Bureau of Land Management and U.S. Fish and Wildlife Service by City of McMinnville, Department of Water and Light).
- Glad, J.B., R. Mishaga, & R.R. Halse. 1987. Habitat characteristics of *Sidalcea nelsoniana* Piper (Malvaceae) at Walker Flat, Yamhill County, Oregon. *Northw. Sci.* 61(4):257-263.
- Halse, R.R. & J.B. Glad. 1986. A note on the status of *Sidalcea nelsoniana* (Malvaceae). *Madroño* 33(3):225-226.
- Halse, R.R., J.B. Glad, & C.J. Antieau. 1992. Noteworthy collections: Washington *Sidalcea nelsoniana* (Malvaceae). *Madroño* 39:244.
- Halse, R.R., B.A. Rottink, & R. Mishaga. 1989. Studies in *Sidalcea* taxonomy. *Northw. Sci.* 63(4):154-161.
- Hitchcock, C.L. 1957. A study of the perennial species of *Sidalcea*. *Univ. Wash. Pub. Biol.* 18:1-79.
- Hitchcock, C.L. & A. Cronquist. 1961. *Vascular Plants of the Pacific Northwest*, Part III. University of Washington Press, Seattle, Washington.
- Hitchcock, C.L., & A. Cronquist. 1973. *Flora of the Pacific Northwest*. University of Washington Press, Seattle, Washington.
- Meinke, R. 1982. Threatened and Endangered Vascular Plants of Oregon: an Illustrated Guide. US Fish and Wildlife Service, with assistance from US Forest Service, Bonneville Power Administration, Bureau of Land Management, and Corps of Engineers.

- ONHDB. 1984. Printout of *Sidalcea nelsoniana* sightings. The Nature Conservancy, Portland, Oregon.
- Peck, M.E. 1961. *A Manual of the Higher Plants of Oregon*. Binford and Mort, Portland, Oregon
- Piper, C.V. 1919. New Pacific Coast plants. Proc. Biol. Soc. Wash. 32:41-44.
- Roush, E. 1931. A monograph of the genus *Sidalcea*. Ann. Mo. Bot. Gard. 18:251-266.
- Siddall, J.L., K.L. Chambers, & D.H. Wagner. 1979. Rare, Threatened and Endangered Vascular Plants in Oregon—An Interim Report. Oregon Natural Area Preserves Advisory Committee, Salem, Oregon.
- Steel, R.G.D. & J.H. Torrie. 1980. *Principles and Procedures of Statistics: A Biometrical Approach*. 2nd. Ed. McGraw-Hill Book Company, New York, New York.
- U.S. Fish and Wildlife Service. 1985. Endangered and threatened wildlife and plants; review of plant taxa for listing as endangered or threatened species: notice of review. Federal Register 50(188):39526-39584.
- U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; determination of threatened status for the plant "*Sidalcea nelsoniana*" (Nelson's Checker-mallow). Federal Register 58(028):8235-8243.

A NEW SPECIES OF *PERITYLE* (ASTERACEAE, HELENIEAE) FROM ARIZONA

A. Michael Powell & Sharon C. Yarborough

Department of Biology, Sul Ross State University, Alpine, Texas 79832
U.S.A.

ABSTRACT

Perityle ambrosiifolia, a new species from Greenlee County, Arizona, is described. Superficially *P. ambrosiifolia* resembles *P. lemmonii* with which it was included by previous monographers of the genus. Morphological evidence suggests that *P. ambrosiifolia* is related to *P. gilensis* or *P. saizicola*, or that it might have arisen through hybridization between rayed and discoid species of *Perityle*.

KEY WORDS: Asteraceae, Helenieae, *Perityle*, Arizona

Preparation of a treatment of *Perityle* for the forthcoming "Vascular Plants of Arizona" has revealed the existence of an undescribed taxon from southeastern Arizona in central Greenlee County, near the New Mexico border. At this time there is limited biological information regarding the new species, but we believe that distinctions are sufficient to warrant formal description, and thus to facilitate the inclusion of a more complete treatment of *Perityle* in the new flora of Arizona.

Perityle ambrosiifolia apparently was first recognized as a species by E.L. Greene. The name "*Laphamia ambrosiaefolia* Greene" is written on at least four sheets of *Davidson 341* and *341a* (see below). Three versions of spelling the epithet are represented on different sheets. Specimens of *Davidson 341* at DS and UC are labeled as "cotypes". We can not find any record, however, that the species as proposed by Greene was formally published. The specific epithet selected by Greene remains an appropriate choice because it is descriptive of the herbage of the new species.

Perityle ambrosiifolia E. Greene *ex* A.M. Powell & S.C. Yarborough, *sp. nov.* Figure 1. TYPE: UNITED STATES. Arizona: Greenlee Co., With *Prosopis*, *Euphorbia*, on face of conglomerate cliff, above San Francisco River bank, S. Clifton, 5 Jun 1935, B. Maguire, B.L. Richards, Jr. & T. Moeller 11787 (HOLOTYPE: NY!; Isotypes: GH!, UC!, US!).

Subfrutices usque ad 30 cm alti, plerumque villosi. Folia laminis 1.7-3.5 cm longis 1.7-3.0 cm latis duplicato-pinnatifidae segmentis lobatis fissis partitis vel divisis. Capitula discoidea vel flores paucos radii efferentes; phyllaria linearia vel lineari-lanceolata 6-9 mm longa 0.5-1.2 mm lata. Corollae disci tubulares vel anguste infundibulares. Pappus plerumque seta singulari valida 2.8-4.5 mm longa compositus, saepe corona squamarum brevium laciniatarum hyalinarum. Achenia 3-4 mm longa marginibus tenuicallosis ac breviciliatis.

Suffruticose perennial, 10-30 cm high, usually villous, occasionally pilose, often with glandular hairs. Stems brittle, densely leafy. Leaves opposite or alternate; petioles 5-10 mm long; lower leaf blades usually 1.7-3.5 cm long, 1.7-3.0 cm wide, tripartitely parted or appearing compound pinnatifid with the segments lobed, cleft, parted, or divided, upper leaves often smaller and less divided, the margins crenate. Heads discoid, or with a few ray flowers; peduncles 3-10 mm long; heads 7-10 mm high, 6-11 mm wide; involucre campanulate; phyllaries 14-20, linear to linear-lanceolate, 6-9 mm long, 0.5-1.2(-2) mm wide, villous. Ray flowers (the few observed) pistillate and fertile; ligules (color unknown) 3-5 mm long, 1.5-2.0 mm wide. Disk flowers 25-45; corollas yellow, 4.0-5.5 mm long, throat glandular, tubular to narrowly funnelform. Pappus usually of a single moderately stout, finely barbellate bristle 2.8-4.5 mm long (occasionally absent or with 2 or 3 subequal or unequal bristles) and often an additional crown of short, lacinate, hyaline scales. Achenes narrowly oblanceolate, with one or both surfaces rounded or angled; 3-4 mm long; margins thin-calloused, short ciliate; surfaces more or less dense with short, appressed hairs. Chromosome number unknown.

Additional specimens examined: UNITED STATES. Arizona: Greenlee Co., Turtle Mountain, South Smith Canyon, (Eagle Creek drainage) on north-facing rhyolite cliff face, elev. 4800-4900 ft, 12 Aug 1976, S.B. Bingham 2462 (ARIZ, ASU); sandstone rocks (Frisco River), Clifton, 15 Oct 1900, A. Davidson 341 (DS, NY, UC); in rock crevices, stem too brittle to survive any where else, Clifton, 30 Oct 1900, A. Davidson 341a (NDG); Eagle Creek, narrow riparian canyon and hillside, elev. 3650 ft, 27 Jun 1977, W.L. Minckley and associates s.n. (ASU); 9 mi NW of Morenci, pinyon-juniper grassland, elev. 4500 ft, 30 Jun 1977, W.L. Minckley and associates s.n. (ASU).

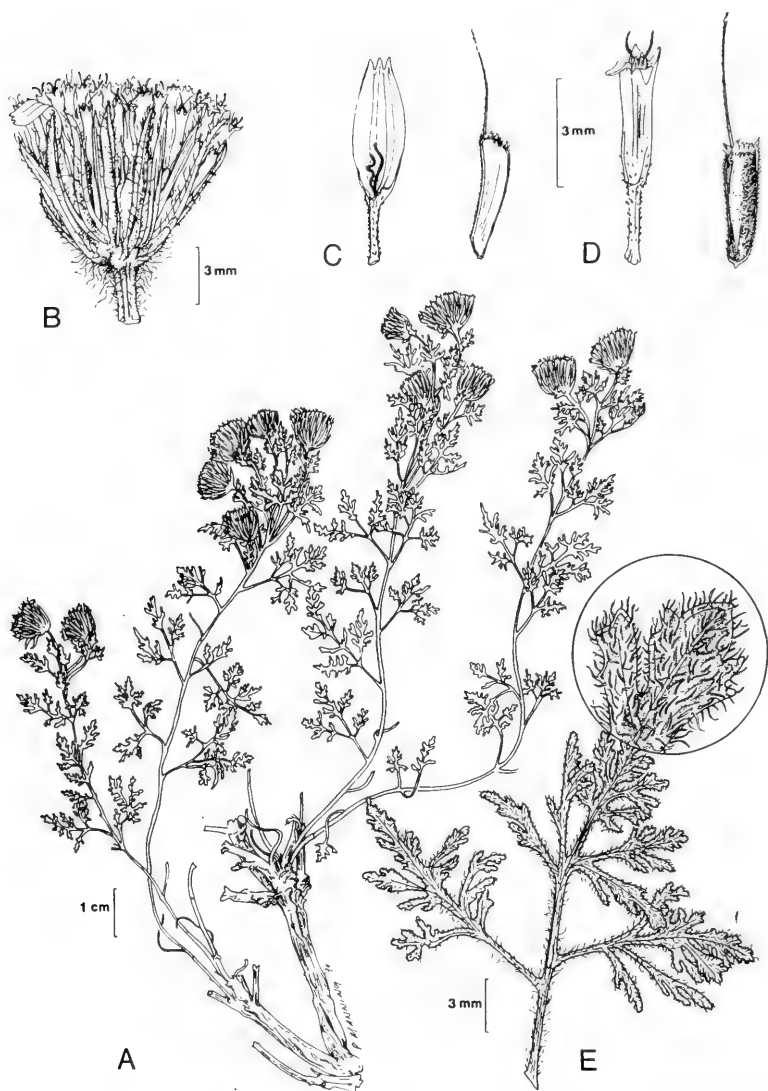


Figure 1. *Perityle ambrosiifolia*, (A) habit, (B) head, (C) ray corolla and achene, (D) disk corolla and achene, and (E) leaf and detail. A and E from Maguire et al. 11787; B-D from Bingham 2462.

Specimens of *Perityle ambrosiifolia* were examined by both Niles (1970) and Powell (1973) in their previous studies of *Perityle*. Both authors assigned the specimens to *P. lemmonii* (A. Gray) Macbr., a widespread and morphologically variable taxon of southcentral and southeastern Arizona and adjacent New Mexico. Niles (1970) made the alignment without comment, except to list "*Laphamia ambrosiifolia* nom. nud." in synonymy. Powell (1973) commented about three collections of *P. ambrosiifolia* from Clifton, Arizona in tentative placement with *P. lemmonii*, referred specifically to the occurrence of ray florets in some heads of certain specimens, and he speculated about the origin of these populations that were not typical of the discoid *P. lemmonii*.

Our current evaluation of *Perityle ambrosiifolia* has included the examination of several additional collections of this taxon that were not available in the early 1970's. We have concluded that *P. ambrosiifolia* is distinct morphologically and geographically from *P. lemmonii*. In fact, further investigations may support our current belief that the similarity of *P. ambrosiifolia* to *P. lemmonii* is superficial, and that its true relationship is with *P. gilensis* Macbride or *P. saizicola* (Eastwood) Shinnery, with which it shares characters of head size, phyllary shape, pappus structure, disk corolla size and shape, and the presence of ray flowers at least in some heads. The color of the ligules is not known but this information alone would be useful in predicting relationship with either the yellow-rayed *P. gilensis* or *P. saizicola*, or with some white-rayed member of the genus. It is possible that *P. ambrosiifolia* could have resulted from intraspecific hybridization (Niles 1970; Powell 1972) between *P. lemmonii* and *P. gilensis* or *P. saizicola*, or intersectional hybridization (Niles 1970; Powell 1970, 1972, 1974) between *P. lemmonii*, *P. gilensis*, or *P. saizicola* and *P. coronopifolia* A. Gray (with white rays). All of these taxa are geographically proximal and their hybrids would be expected to exhibit at least some characters of *P. ambrosiifolia* (Niles 1970). As pointed out by Powell (1973), *P. ambrosiifolia* also shares some features with *P. dissecta* (Torr.) A. Gray of trans-Pecos Texas and adjacent Chihuahua, México.

ACKNOWLEDGMENTS

We are grateful to Leslie R. Landrum, Herbarium Curator, Arizona State University, and to Lyle A. McGill for providing information regarding early collections of *Perityle ambrosiifolia*. Barbara J. Hellenthal, Curator, Notre Dame Herbarium, kindly furnished information about early collections studied by E.L. Greene. We also thank Guy Nesom for the Latin translation, and Nesom and B.L. Turner for reviewing the manuscript. Patricia Manning provided the line drawings.

LITERATURE CITED

- Niles, W.E. 1970. Taxonomic investigations in the genera *Perityle* and *Laphamia* (Compositae). Mem. N.Y. Bot. Gard. 21:1-82.
- Powell, A.M. 1970. Natural intersectional hybridization in *Perityle* (Compositae). Brittonia 22:3-10.
- Powell, A.M. 1972. Artificial hybridizations in the subtribe Peritylinae (Compositae-Helenieae). Amer. J. Bot. 59:760-768.
- Powell, A.M. 1973. Taxonomy of *Perityle* section *Laphamia* (Compositae-Helenieae-Peritylinae). Sida 5:61-128.
- Powell, A.M. 1974. Taxonomy of *Perityle* section *Perityle* (Compositae-Peritylinae). Rhodora 76:229-306.

FIRST REPORT OF *CASTILLEJA ORNATA* (SCROPHULARIACEAE) FROM THE UNITED STATES

Laird McIntosh

Bureau of Land Management, Las Cruces, New Mexico 88005 U.S.A.

ABSTRACT

A collection reported from the United States in southern New Mexico by the author has been identified as *Castilleja ornata* Eastwood. The species was previously known only from México in the states of Chihuahua and Durango. Tentative taxonomic relationships to *Castilleja glandulosa*, *C. palmeri*, *C. pediaca*, *C. macrostigma*, and *C. sphaerostigma* are discussed. A category of rarity status has been proposed for the species due to the alteration of its grassland habitat and infrequency of collections.

KEY WORDS: Scrophulariaceae, *Castilleja*, New Mexico, México, range extension

General collecting activities in extreme southwestern New Mexico on the Gray Ranch, a preserve owned by the Animas Foundation and managed in cooperation with the Nature Conservancy, produced a number of interesting collections, among them the following first record for the United States:

UNITED STATES. New Mexico: Hidalgo Co., ca. 60 km S of Animas, ca. 100 m N of the old Fitzpatrick's ranch house, T33S R20W, sect. 27, NE $\frac{1}{4}$ of SW $\frac{1}{4}$, elev. 1570 m, plants scattered in level clay loam with *Sporobolus airoides* and *Ambrosia psilostachya*, growth habit erect, bracts and flowers yellowish-green, 20 August 1993, L. McIntosh 2805 (NMC). Det. by Dr. Guy L. Nesom.

Castilleja ornata Eastwood is a species previously known only from the western portions of the Mexican states of Chihuahua and possibly Durango. The inflorescence of this annual plant is usually yellow, though a few plants with pale red bracts are found in herbaria (Mark Egger, pers. comm., 1994).

Collections have been recorded from this region in 1887, 1899, 1906, 1908, 1936, 1960, 1985, and 1993. Judging from the few collections present in herbaria, this species is seldom collected, and its distribution and frequency in the field is not completely known. The United States record represents an approximately 140 km range extension from the closest known station in Mexico (Figure 1).

According to Eastwood, *Castilleja glandulosa* Greenman is the closest relative of *C. ornata* (1909). *Castilleja glandulosa* is reduced to synonymy under *Castilleja scorzoneraefolia* Kunth by Nesom (1992). The southernmost known collection of *C. ornata*, from Otinapa, Durango, was originally identified as *Castilleja palmeri* Eastwood, which T.I. Chuang (pers. comm. 1994) is tentatively reducing to a synonym of *C. ornata*. Chuang states in the same communication that he is also reducing *Castilleja pediaca* Eastwood to a synonym of *C. ornata* and placing these, along with *Castilleja macrostigma* Robinson and *Castilleja sphaerostigma* Eastwood, into a closely related group, which he tentatively refers to as the "*Castilleja macrostigma* complex". The species relationships within this complex have yet to be clarified, and much additional field work in México will be necessary to properly resolve their taxonomy. All of these taxa are members of sect. *Euchroma* (Nutt.) Benth. (*sensu* Eastwood 1909).

The little habitat information available suggests that *Castilleja ornata* grows in relatively level grasslands. Until recently the western parts of Chihuahua and Durango have been comparatively difficult to access. Roads were dirt until ca. 10-20 years ago. This region is not near any major collecting university, and has not been part of an area under intensive consideration for a flora (as compared to, say, the Chihuahuan Desert). Finally, the grasslands in the area have had several centuries of extremely heavy use and are among the most severely altered and perhaps endangered habitats in the Southwest, second only to riparian areas. Due to these factors, population numbers, viability, and stability in México cannot be determined.

The U.S. site has had a reduction in grazing use for the past three years (Ben Brown, pers. comm. 1994), and the abundance of the weedy *Ambrosia psilostachya* DC. mixed with *Sporobolus airoides* (Torr.) Torr. indicates a seral stage of succession. During a site visit on April 18, 1994, additional standing dead plants from the previous growing season were found in a less weedy area with more *Sporobolus airoides* about 150 to 200 meters east of the original collection site. These plants were concentrated on the fringes of a colony of *Juncus balticus* Willd., which was mixed with *S. airoides*. This area appeared to be less disturbed by previous and current livestock grazing than the original collection site, and the *C. ornata* plants were denser and more numerous. As these plant communities continue to change, the persistence of the *C. ornata* population cannot be predicted. The species has been nominated tentatively as a candidate for Federal listing as threatened or endangered, pending further information on the number of individuals and populations, and the types, if

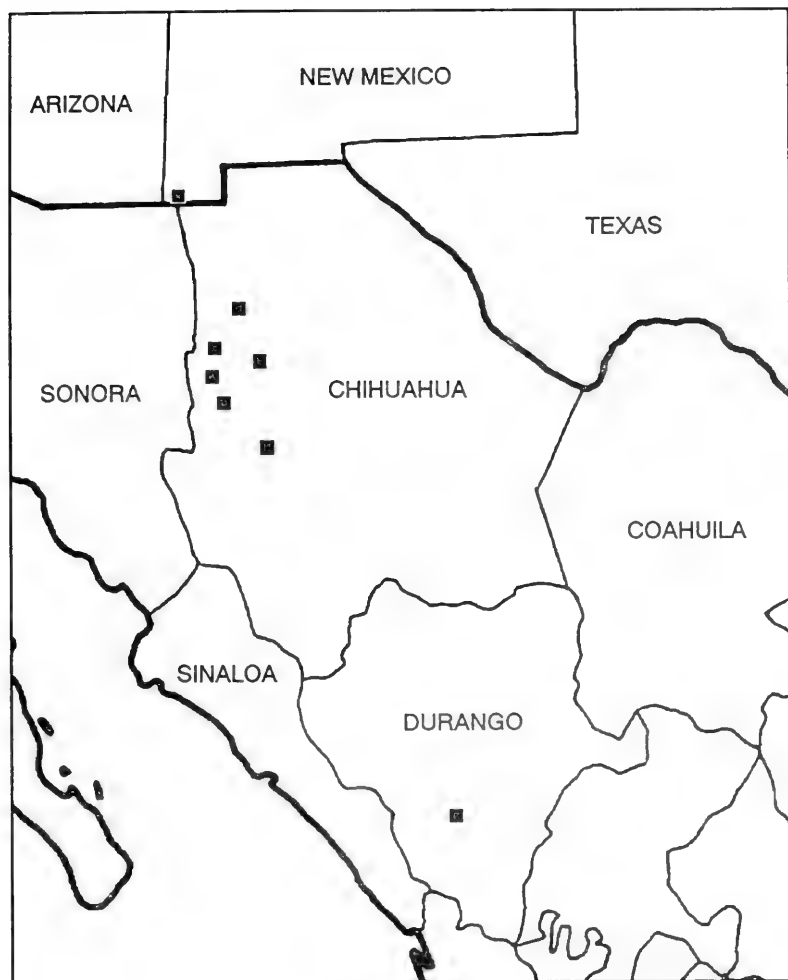


Figure 1. Known distribution of *Castilleja ornata* in northwestern México and the southwestern United States. The new United States record is approximately 140 km N of previously known stations.

any, of natural or man-made threats to the species' survival.

ACKNOWLEDGMENTS

I wish to thank Dr. Richard Spellenberg and Mark Egger for their review and technical assistance. I also wish to express my appreciation to Dr. Guy L. Nesom, Dr. T.I. Chuang, and Dr. Noel H. Holmgren for their taxonomic advice; and to the University of New Mexico and the Animas Foundation for sponsoring the botanical expedition on the Gray Ranch property.

LITERATURE CITED

- Eastwood, Alice. 1909. Synopsis of the Mexican and Central American species of *Castilleja*. Proc. Amer. Acad. Arts 44:563-591.
- Nesom, G.L. 1992. New species and taxonomic evaluations of Mexican *Castilleja* (Scrophulariaceae). Phytologia 72:231-252.

NATIVE SPECIES OF *BAUHINIA* (CAESALPINIACEAE) OCCURRING IN NORTHEASTERN MEXICO

Billie L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

Seven native species of *Bauhinia* are recognized as occurring in northeastern México (states of Coahuila, Nuevo León, and Tamaulipas). These are *Bauhinia bartlettii* B.L. Turner, *sp. nov.*, *B. coulteri* Macbride, *B. divaricata* L., *B. lunarioides* A. Gray ex S. Wats., *B. macranthera* Benth. ex Hemsl., and *B. uniflora* S. Wats. A key to the species is prepared, and distributional maps for each are provided.

KEY WORDS: Caesalpiniaceae, *Bauhinia*, México

Wunderlin (1983) provided a revision of the arborescent *Bauhinias* native to Middle America. In this he recognized 27 species, five of these native to northeastern México: *B. coulteri* Macbride, *B. divaricata* L., *B. lunarioides* A. Gray ex S. Wats., *B. macranthera* Benth. ex Hemsl. and *B. ramosissima* Benth. ex Hemsl. The latter species was recognized as an assemblage of variable populations or individuals, six of which had been given names by Britton & Rose (1930). After examination of its holotype, I have reassessed the status of *B. ramosissima* and aggregates, concluding that *B. uniflora* S. Wats. (including *B. monantha* [Britt. & Rose] Lundell) is a valid species. Additionally, from among the specimens included in *B. macranthera* by Wunderlin I have described a new species, *B. bartlettii* B.L. Turner. This brings to seven the number of native *Bauhinias* occurring in northeastern México.

The distributional maps (Figures 2-5) are based upon numerous specimens on deposit at LL, TEX.

KEY TO NATIVE SPECIES OF *BAUHINIA* IN NORTHEASTERN MEXICO

1. Leaves (most of them) bilobed, the leaflets fused at the base for 4-30 mm. (2)
1. Leaves (all of them) 2-foliolate, the leaflets not fused, or fused at the base for 3 mm or less. (4)
 2. Fertile stamens 2-3; leaves rounded in outline. *B. coulteri*
 2. Fertile stamens 1; leaves ovate in outline. (3)
3. Petals white or creamy-white; lobes of leaves mostly acute at apices. .
B. divaricata
3. Petals rose to purple, lobes of leaves mostly broadly rounded at apices. .
B. macranthera
 4. Larger leaflets mostly (4-)5-9 cm long, their apices acute or narrowly obtuse. *B. bartlettii*
 4. Larger leaflets mostly 1-4(-5) cm long, their apices broadly rounded. (5)
5. Larger leaflets mostly (1.5-)2.0-4.0(-5.0) cm long. *B. ramosissima*
5. Larger leaflets mostly 0.7-1.5 cm long. (6)
 6. Petals white to pale pink; young legumes glabrous or nearly so. .
B. lunarioides
 6. Petals decidedly dark pink to purple; young legumes pubescent throughout. *B. uniflora*

1. ***Bauhinia bartlettii*** B.L. Turner, *sp. nov.* Figure 1. TYPE: MEXICO: Tamaulipas: Mpio. Hidalgo, W of Santa Engracia, 9.2 mi W of Guayabas, 4 mi W of the Guayabas-Adelaida junction, N-facing slope of steep canyon; limestone bedrock, subtropical deciduous woods, 430 m, 16 Apr 1988, *Guy Nesom 6312*, with L. Hernández, M. Martínez, J. Jiménez (HOLOTYPE: TEX!; Isotype: MEXU!).

Bauhiniae macranthae Benth. ex Hemsl. similis sed foliis bifoliolatis foliolis libris angustioribus ad apices anguste obtusos vel acutos gradatis angustatis (vs. foliis bilobatis foliolis connatis, lobis ad apices late obtusis vel rotundatis) et petalis albis vel cremeis (vs. roseis).

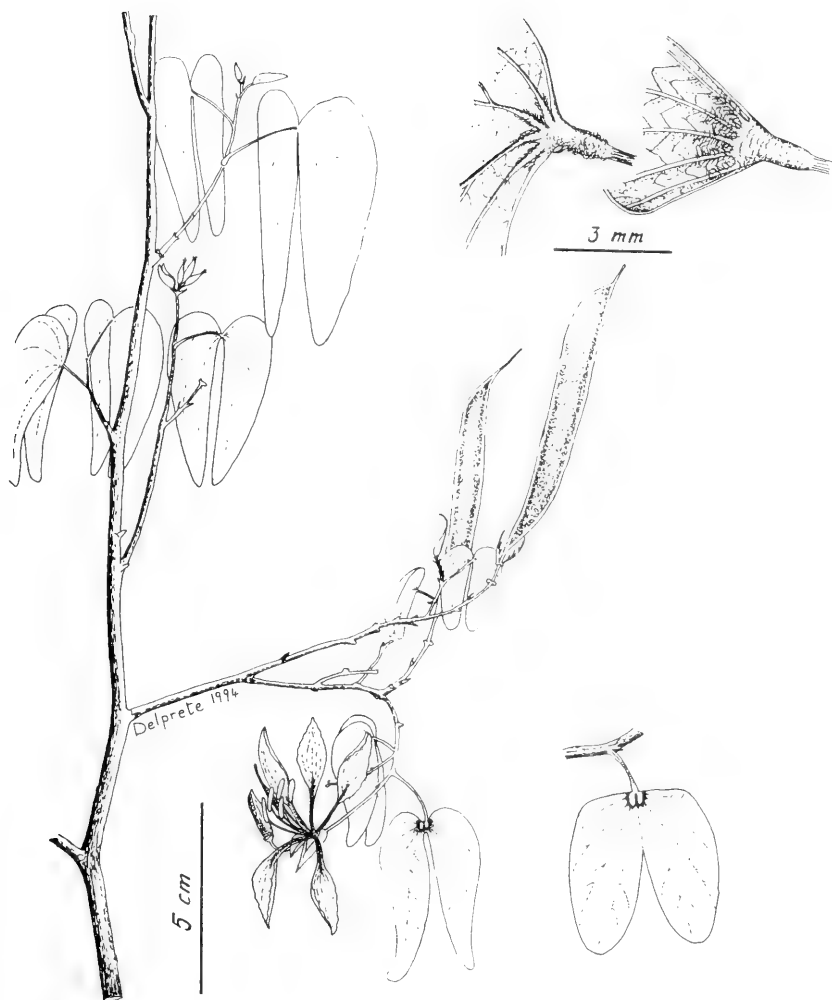


Figure 1. *Bauhinia bartlettii* (from holotype); lower right, detached leaf of *B. macranthera*; upper right, detail of leaf-under surfaces: to left, *B. bartlettii*; to right, *B. ramosissima*.

Small, loosely branched trees to 4 m high. Young stems very sparsely brown-puberulent to glabrate. Leaves with leaflets free to the base; leaflets falcate, mostly 5-9 cm long, 1.8-3.0 cm wide, glabrous or nearly so, the bases rounded, the apices narrowly obtuse to acute. Flowers 3-5, arranged in terminal racemes 2-4 cm long. Petals 5, claws ca. 15 mm long, pubescent; blades \pm similar, white or cream-colored, lanceolate, their apices acute. Fertile stamens 1, the fertile anthers ca. 6 mm long. Young legumes sparsely puberulent with broad-based hairs; mature legumes 6-10 cm long, 1.0-1.4 cm wide, glabrate. Seeds black, glabrous, ca. 9 mm long, 5 mm wide, faintly cross-ridged.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Tamaulipas: Sierra de San Carlos, El Palmar, vicinity of El Milagro, 24 Aug 1930, *Bartlett 11107* (LL); vicinity of El Milagro, 26 Aug 1930, *Bartlett 11181* (LL).

Wunderlin, by annotation (1979, LL), positioned collections of this taxon in his concept of *Bauhinia macranthera*, apparently in belief that the two Bartlett specimens concerned (cited above) were but bifoliolate forms of that species. Both specimens are in fruit and were initially annotated by the collector as "*Bauhinia bifoliola* Bartlett sp. nov.", a name that was never published. The more recent type collection reveals that the taxon is abundant at some localities in east-central Tamaulipas along the front range of the Sierra Madre Oriental (Nesom, pens. comm.) at relatively low elevations (400-500 m). It is readily distinguished from *B. macranthera* by its much larger bifoliolate leaves, approaching in size those of *B. divaricata*, and having the cream-colored corollas of the latter, but differing from it in having ununited glabrous leaflets. *Bauhinia bartlettii* not only differs from *B. macranthera* in having bifoliolate leaves, but the leaflets themselves are consistently narrower with gradually tapered, narrowly obtuse or acute apices (Figure 1).

2. *Bauhinia coulteri* Macbride, Contr. Gray Herb. 59:22. 1919.

Wunderlin (1983) provided a solid assessment of this taxon, noting that "No other species of *Bauhinia* [except *B. coulteri*] in Mexico has three fertile anthers". He recognized two varieties: var. *coulteri* (shrubs to 0.8-3.0 m high with sparsely pubescent to nearly glabrous lower-leaf surfaces); and var. *arborescens* Wunderlin (a small tree 5-6 m high with densely tomentose leaves from northernmost Querétaro state near Pinal de Amoles where it reportedly occurs at ca. 2700 m, its only known locality).

3. *Bauhinia divaricata* L., Sp. Pl. 374. 1753.

This is a widely distributed highly variable species extending, in its northernmost range, to the states of Tamaulipas and Sinaloa, México (Figure 3); southwards it reaches Costa Rica, and eastwards to the Caribbean Islands.

Wunderlin (1983) provided a seemingly sound treatment of the taxon, including under this about 22 names in synonymy.

4. *Bauhinia lunarioides* A. Gray ex S. Wats., *Bibl. Ind. N. Amer. Bot.* 205. 1878. TYPE: MEXICO. Coahuila: Rocky hills near Santa Rosa, Perry 2901A (HOLOTYPE: GH).

Bauhinia congesta Britt. & Rose. *Casparia congesta* (Britt. & Rose) Lundell.

Bauhinia jermyna (Britt.) Lundell. *Casparia jermyna* Britt.

My concept of this well-marked, white-flowered species is the same as Wunderlin's. It is mostly confined to the eastern parts of Coahuila and closely adjacent Nuevo León (Figure 5), extending just across the U.S.A. border into western Texas.

5. *Bauhinia macranthera* Benth. ex Hemsl., *Diag. Pl. Nov.* 49. 1880. *Casparia macranthera* (Benth. ex Hemsl.) Britt. & Rose, *N. Amer. Fl.* 23:212. 1930. TYPE: MEXICO. Hidalgo: Zimapan, 1827, Coulter s.n. (HOLOTYPE: K!).

Bauhinia retifolia Standl., *Contr. U.S. Natl. Herb.* 23:416. 1922. *Casparia retifolia* (Standl.) Britt. & Rose, *N. Amer. Fl.* 23:213. 1930. TYPE: MEXICO. San Luis Potosí: Rascon, 1911, Purpus 5268 (HOLOTYPE: US; Isotypes: F, MEXU, MO, NY, UC) -fide Wunderlin (1983).

Casparia lunarioides A. Gray ex Britt. & Rose, *N. Amer. Fl.* 23:212. 1930. \equiv *Bauhinia macranthera* Benth. ex Hemsl. var. *grayana* Wunderlin, *Phytologia* 15:53. 1967. TYPE: MEXICO. Nuevo León: Sierra de la Silla, Monterrey, 27 May 1889, Pringle 2529 (Isotype: TEX!).

This species is superficially similar to *Bauhinia ramosissima* but is readily distinguished by its united, somewhat larger, leaflets with markedly pilose basal veins on the undersurfaces (vs. appressed-strigopuberulous to glabrous). It mostly occurs along the eastern slopes of the Sierra Madre Oriental, as indicated in Figure 5.

Wunderlin, by annotation, included in this taxon elements which I refer to *Bauhinia bartlettii*. The sheets concerned (Bartlett 11107, 11181 [LL]) have large ununited essentially glabrous leaflets which are mostly ca. 3 times as long as wide and gradually taper to acute apices (or nearly so). He apparently

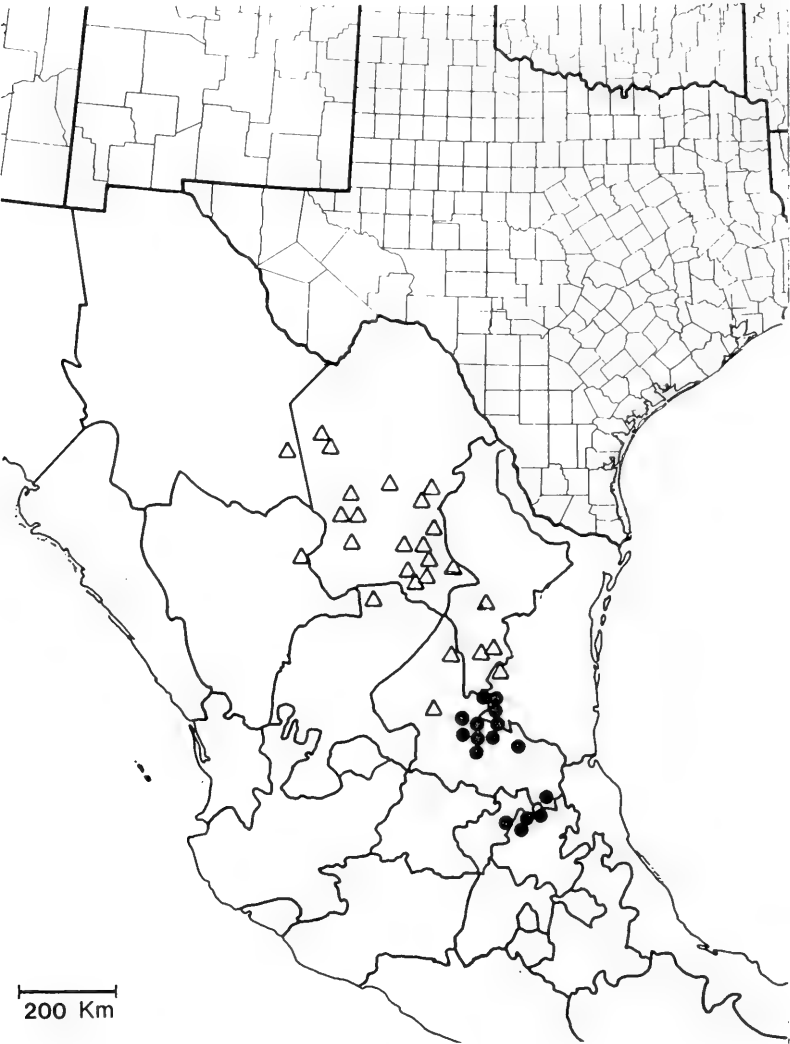


Figure 2. Distribution of *Bauhinia coulteri* (closed circles) and *B. uniflora* (open triangles).

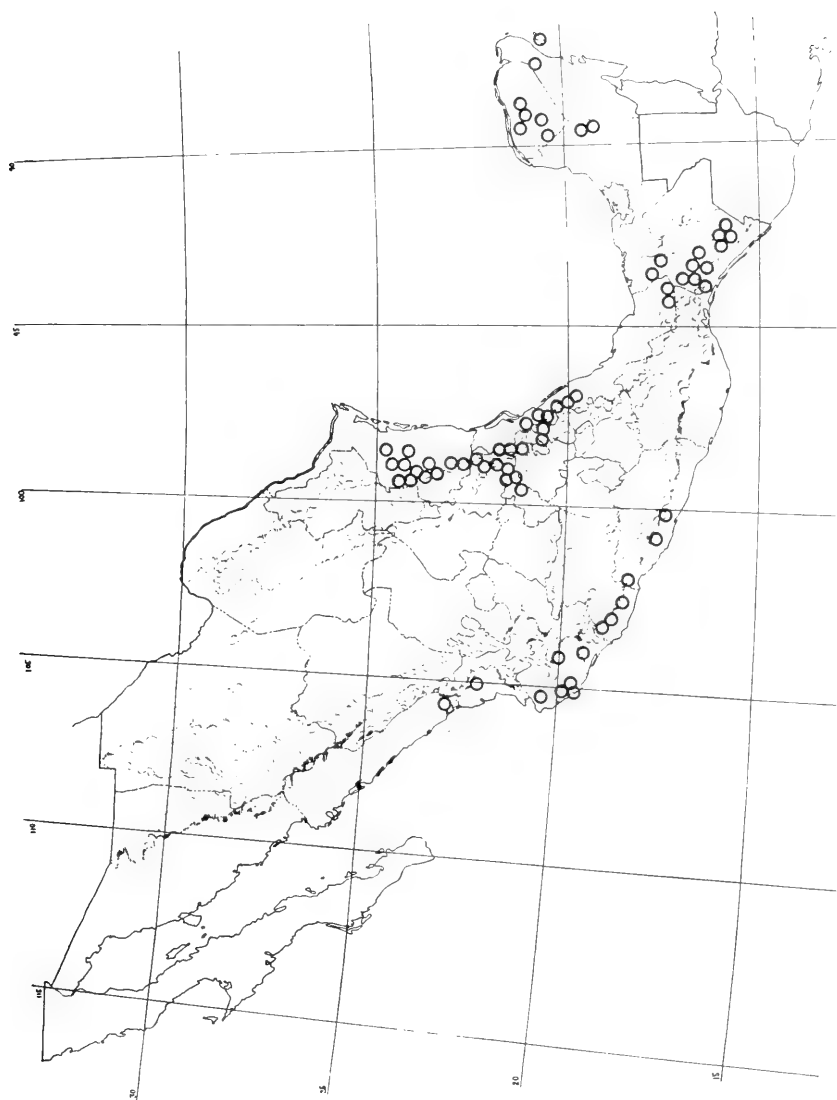


Figure 3. Distribution of *Bauhinia divaricata* in México.

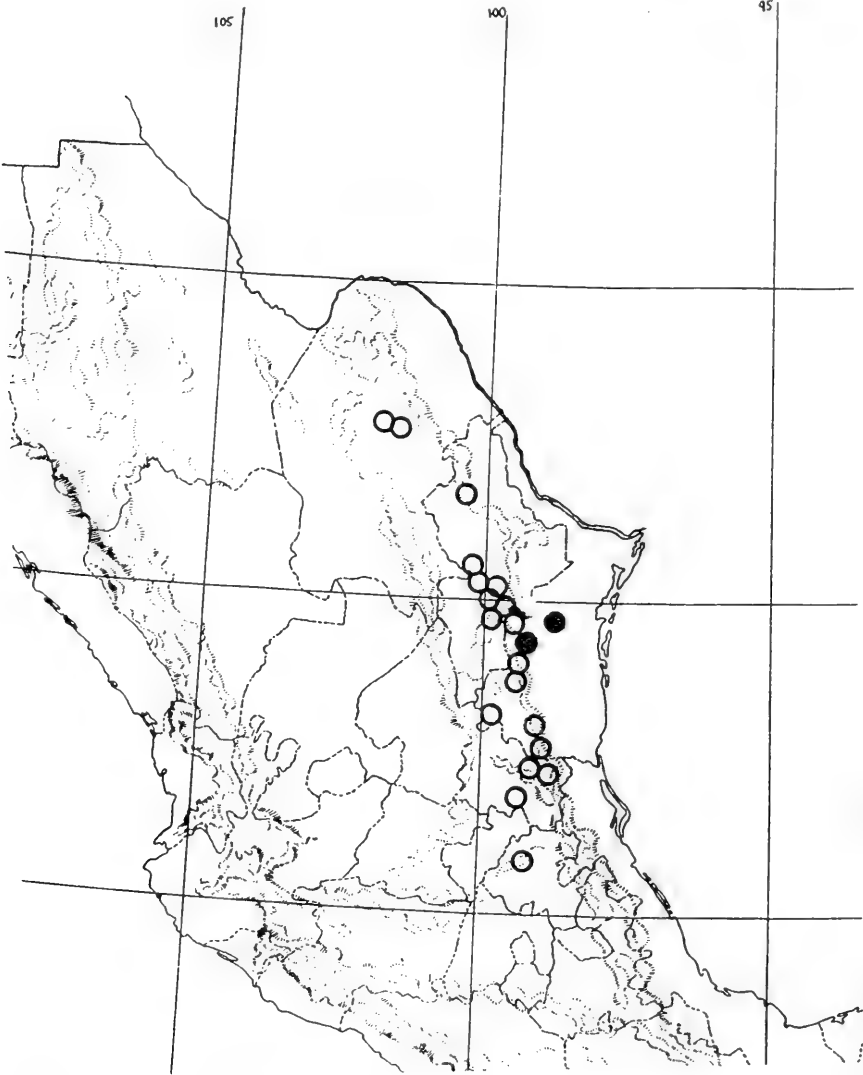


Figure 4. Distribution of *Bauhinia bartlettii* (closed circles) and *B. macranthera* (open circles).

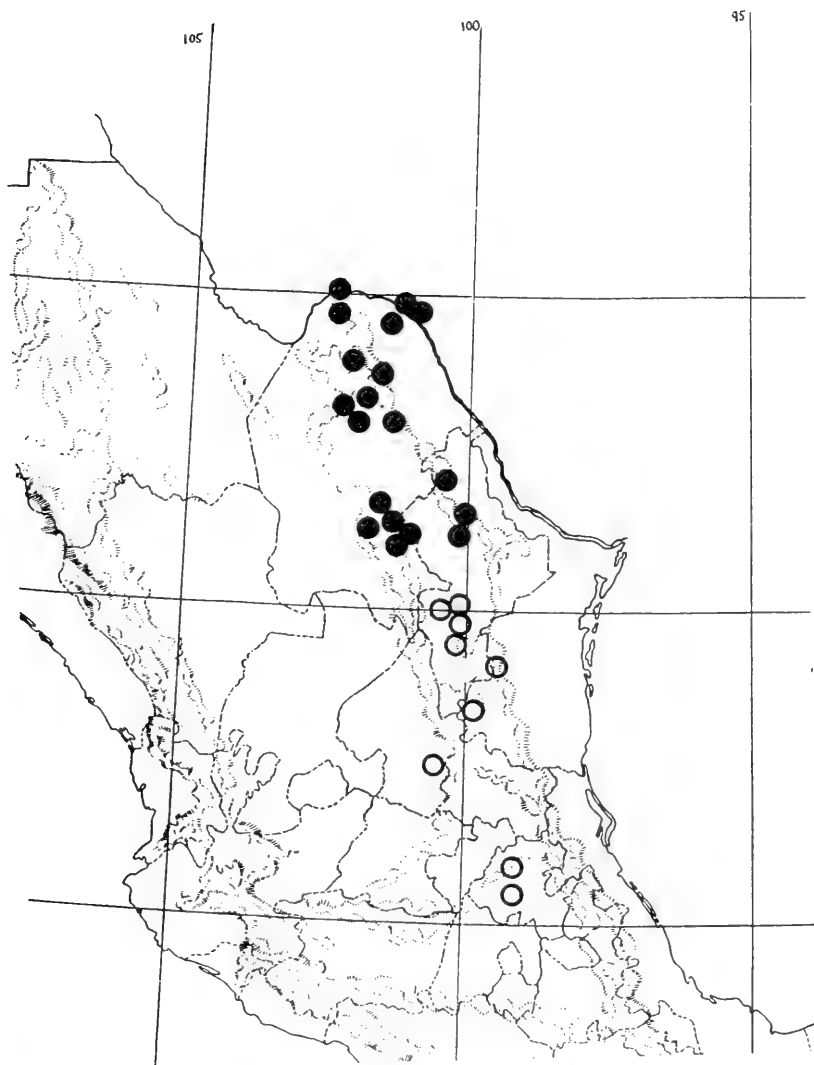


Figure 5. Distribution of *Bauhinia lunarioides* (closed circles) and *B. ramosissima* (open circles).

took these two sheets to be bifoliate forms of *B. macranthera* (which is otherwise bilobate), to judge from his description of the latter ("leaves ... rarely bifoliate").

The type specimen of *Bauhinia macranthera* (K!) has leaves that are evenly and markedly short-pilose throughout. With age the pubescence persists as spreading pilose hairs along the larger veins, making it possible to distinguish most sterile material of *B. macranthera* from *B. ramosissima* and *B. bartlettii* (Figure 1), even were the occasional bifoliate form to be found.

6. *Bauhinia ramosissima* Benth. ex Hemsl., *Diag. Pl. Nov.* 49. 1880.

Casparia ramosissima (Benth. ex Hemsl.) Britt. & Rose, *N. Amer. Fl.* 23:210. 1930. TYPE: MEXICO. Hidalgo: Zimapan, 1827, *Coulter 479* (HOLOTYPE: K!).

Bauhinia unguicularis Benth. ex Hemsl., *Diag. Pl. Nov.* 49. 1880.

Casparia unguicularis (Benth. ex Hemsl.) Britt. & Rose, *N. Amer. Fl.* 23:210. 1930. TYPE: MEXICO. Hidalgo: Zimapan, 1827, *Coulter 472* (HOLOTYPE: K!; Possible isotype: K!).

Casparia purpusii Britt. in Britt. & Rose, *N. Amer. Fl.* 23:210. 1930.

Bauhinia purpusii (Britt.) Lundell, *Phytologia* 1:214. 1937. TYPE: MEXICO. Hidalgo: Ixmiquilpan, Jul 1905, *Purpus 1964* (HOLOTYPE: NY; Isotypes: F, MO, UC) - *fide* Wunderlin (1983).

Casparia runyonii Britt. & Rose, *N. Amer. Fl.* 23:210. 1930. *Bauhinia runyonii* (Britt. & Rose) Standl., *Trop. Woods* 34:41. 1933. TYPE: MEXICO. Tamaulipas: mountains near Cd. Victoria in canyon along road to Juamave, 8 Apr 1925, *Runyon 748* (LECTOTYPE: NY, designated by Wunderlin 1983; Probable isotype: TEX!).

Wunderlin (1983) circumscribed *Bauhinia ramosissima* so as to include *B. uniflora*, but noted that "Additional field study may show that some populations represent distinct taxa". Even without field studies it is relatively easy to distinguish *B. uniflora* from among numerous herbarium sheets referable to *B. ramosissima*. The latter name is typified by material from Zimapan, México (K!). *Bauhinia uniflora* is readily distinguished from *B. ramosissima* by its consistently smaller different shaped leaflets (mostly 0.5-1.5 cm long, 1-2 times as long as wide, vs. mostly 2-4 cm long, 2-3 times as long as wide). Additionally, the corollas of *B. uniflora* are mostly purple or reddish-purple and the young legumes are densely white-strigose (vs. corollas pinkish and young legumes sparsely tawny-pilose to \pm glabrescent).

The holotype of *Bauhinia unguicularis*, also from Zimapan (K!), has quite large leaves, varying from 3.5-5.0 cm long, 1.5-2.5 cm wide, and the very young

legumes are only moderately pubescent with tawny-puberulent hairs, while the holotype of *B. ramosissima* has relatively smaller leaflets, varying from 1.5-2.5 cm long, 0.7-1.0 cm wide, and the very young legumes are only sparsely tawny-pubescent to nearly glabrous. A probable isotype of *B. ramosissima* (K!) has somewhat larger leaves than the holotype (mostly 2-3 cm long), but otherwise appears the same. Both of the type sheets appear to be small-leaved forms of *B. ramosissima* but neither clearly relates to *B. uniflora*, as noted in the above account.

7. *Bauhinia uniflora* S. Wats., Proc. Amer. Acad. Arts 31:451. 1886; non Hassler, 1911. *Casparia uniflora* (S. Wats.) Britt. & Rose, *N. Amer. Fl.* 23:209. 1903. TYPE: MEXICO. Coahuila: Jimulco, 27 Apr 1885, Pringle 174 (HOLOTYPE: GH; Isotype: TEX!).

Casparia monantha Britt. & Rose, *N. Amer. Fl.* 23:209. 1930. *Bauhinia monantha* (Britt. & Rose) Lundell, *Phytologia* 1:214. 1937. TYPE: MEXICO. Coahuila: General Cepeda, 16-17 Aug 1904, Palmer 330 (HOLOTYPE: US; Isotype: TEX!).

This taxon was included by Wunderlin (1983) in his concept of *Bauhinia ramosissima*, as noted in my discussion of the latter. Nearly all collectors have described *B. uniflora* as an intricately branched shrub or shrublet 0.8-2.0 m high, while *B. ramosissima* is consistently described as a weak tree 2.5-5.5 m high. The latter occurs along the eastern slopes of the Sierra Madre Occidental from central Nuevo León to Hidalgo, while *B. uniflora* is largely confined to more western arid regions of northcentral México (Figure 2).

ACKNOWLEDGMENTS

I am grateful to the Director of K for the loan of appropriate types. Guy Nesom prepared the Latin diagnosis, and both he and T.P. Ramamoorthy reviewed the manuscript. Piero Delprete produced the illustration (Figure 1).

LITERATURE CITED

- Britton, N.L. & J.N. Rose. 1930. *Bauhinia*, in *N. Amer. Fl.* 23:301-349.
- Wunderlin, R.P. 1983. Revision of the arborescent Bauhinias (Fabaceae: Caesalpinioideae: Cercideae) native to Middle America. *Ann. Missouri Bot. Gard.* 70:95-127.

NOW AVAILABLE, PHYTOLOGIA MEMOIRS, Volume 9

THE UNIVERSITY OF TEXAS HERBARIA TYPE REGISTER

CAROL A. TODZIA

1994, 8 1/4 × 10 3/4 in., 288 pp., \$17.95, ISBN 0-9642085-0-4.

A comprehensive listing of the type specimens found in the University of Texas at Austin Herbaria (LL, TEX). Each specimen fully documented with taxonomic, locality, and publication information. An invaluable reference for anyone requiring information on type specimens from the United States and Latin America (where the majority of the specimens originated).

A limited supply of *Phytologia* Memoirs volumes 1 (A Fifth Summary of the Verbenaceae, Avicenniaceae, Stilbaceae, Dicrastylidaceae, Symphoremaceae, Nyctanthaceae, and Eriocaulaceae of the World as to Valid Taxa, Geographic Distribution, and Synonymy—\$7.95) and 2 (A Sixth Summary of the Verbenaceae, Avicenniaceae, Stilbaceae, Dicrastylidaceae, Symphoremaceae, Nyctanthaceae, and Eriocaulaceae of the World as to Valid Taxa, Geographic Distribution, and Synonymy—\$12.95) are also available.

Please complete order form and send to: *Phytologia*, 185 Westridge Drive, Huntsville, TX 77340-8916 U.S.A.

Telephone (409) 295-5410; FAX (409) 291-0009; Federal EIN 76-0274455

Please reserve my copy(ies) of PHYTOLOGIA MEMOIRS as indicated below:

_____ copy(ies) *Phytologia* Memoirs 9; Todzia, *The University of Texas Herbaria Type Register* @ \$17.95 per copy. \$ _____

_____ copy(ies) *Phytologia* Memoirs 1; Moldenke, *Fifth Summary* ... @ \$7.95 per copy. _____

_____ copy(ies) *Phytologia* Memoirs 2; Moldenke, *Sixth Summary* ... @ \$12.95 per copy. _____

Shipping/handling (\$3.95 first copy; \$2.85 each additional) . _____

Subtotal _____

Texas residents please add 8.25% sales tax _____

Total \$ _____

All orders payable in advance in U.S. dollars, free of any service charges. Shipping rates quoted are for surface delivery, allow 4-6 weeks for delivery in the U.S., longer overseas. For air shipping, remit an additional \$8.40 per copy to U.S. addresses, or \$16.20 to overseas addresses.

Thank you.

This page may be reproduced without restriction.

New York Botanical Garden Library



3 5185 00288 4730

Information for Authors

Articles from botanical systematics and ecology, including biographical sketches, critical reviews, and summaries of literature will be considered for publication in PHYTOLOGIA. Manuscripts may be submitted either on computer diskette, or as typescript. Diskettes will be returned to authors after action has been taken on the manuscript. Diskettes may be 5.25 inches or 3.5 inches and may be written in any IBM or MacIntosh compatible format. Typescript manuscripts should be single spaced and will be read into the computer using a page scanner. The scanner will read standard typewriter fonts but will not read dot matrix print. Manuscripts submitted in dot matrix print cannot be accepted. Use underscore (not italics) for scientific names. Corrections made on typescript manuscripts must be complete and neat as the scanner will not read them otherwise. Language of manuscripts may be either English or Spanish. Figures will be reduced to fit within limits of text pages and therefore, should be submitted with an internal scale and have dimensions proportional to those for text pages. Legends for figures should be included in figures whenever possible. Each manuscript should have an abstract and key word list. Specimen citations should be consistent throughout the manuscript. Serial titles should be cited with abbreviations used in *Botanico Periodicum Huntianum*. References cited only as part of nomenclatural summaries should not appear in Literature Cited. Nomenclatural work should include one paragraph per basionym and must provide proper (as defined by the current *International Code of Botanical Nomenclature*) citation of sources of epithets and combinations.

Authors should arrange for two workers in the appropriate field to review the manuscript before submission. Copies of reviews should be forwarded to the editor with the manuscript. Manuscripts will not be published without review.

Cost of publication is currently \$13.00 US per page for publication without reprints. Publication with 100 reprints is provided for \$18.00 US per page, 200 reprints for \$21.50 US per page. Page charges are due with manuscript and no paper will be published before payment is received in full. Reprints must be ordered and paid for in advance. Page charges will be determined on the basis of a typescript page (single spaced, 10 points, blank line between paragraphs) with all type inside a rectangle 143 mm (horizontal) by 219 mm (vertical), not including running head and page number. Title page should include title, author(s) name(s), and address(es). Two blank lines should appear above and below section headings (Abstract, Discussion, Literature Cited, etc.) in the manuscript. No extra charge is made for line drawings provided they conform to limitations of size and proportion for normal text. Halftones require an extra charge of \$10.00 US per page.